Westbound					
Operating Speed (85th percentile)	V	110	110	km/h	
Longintudinal Grade	a ₂	1	1	%	
SSD		205	235	m	
SISD		296.81	326.85	m	
ASD - Terminating Road		Cars	Trucks		
Reaction time - Rural locality	R _T	2	2	sec	AGRD03 T5.2
Operating Speed (85th percentile)	V	40	40	km/h	
Coefficient of Deceleration	d	0.362	0.22		T3.1
Exiting Southern property			1	-	
Longintudinal Grade	а	-5	-5	%	
ASD		42	59	m	
11000					
MGSD Operating (peed (95th percentile)	M	110	lung /h		
Entering Turning left	v	110	KIII/II		
Acceptance gap	t	5	sec		T2 4 worst case
Follow up boodwoy	•a +	э Э	500		T2.1 worst case
	ե	3	Sec		12.4 W013t Case
Gap distance (t _a only)	Da	152.79	m		
Gap distance (t _a & t _f)	D_{a}	244.464	m		
Entering Turning right		_			
Acceptance gap	t _a	5	sec		T2.4 worst case
Follow up headway	t _f	3	sec		T2.4 worst case
Gap distance (t _a only)	D _a	152.79	m		
Gap distance (t _a & t _f)	Da	244.464	m		

Local Government Engineering Services

Proposed Highway Intersection and Turning Lane Upgrade

Gwydir Highway Glen Innes NSW

Geotechnical Report - Rev.1

Report No. RG\$30969.1 – AB Rev.1 14 December 2016





Manning-Great Lakes Port Macquarie Coffs Harbour

RG\$30969.1 – AB Rev.1

14 December 2016

Local Government Engineering Services 162 Otho Street INVERELL NSW 2360

Attention: Andrew Dekkers

Dear Andrew

RE: Proposed Highway Intersection and Turning Lane Upgrade – Gwydir Highway Glen Innes NSW

Geotechnical Report - Rev.1

Regional Geotechnical Solutions Pty Ltd (RGS) has completed geotechnical investigations and assessment for the proposed intersection to be constructed on the Gwydir Highway to the west of Glen Innes NSW.

This revised report has been prepared following review of the original report by Roads and Maritime Services (RMS). RMS have requested that the following:

- Lowest measured CBR of 4% to be adopted for pavement thickness design;
- Minimum Pavement thickness of 450mm;
- Flexible granular pavement rather than bound pavement;
- Two coat seal wearing surface rather than AC;
- Interface drain between the existing and new pavements; and
- Adoption of RMS specifications.

This report presents the results of the investigations, pavement designs and general construction requirements for the proposed works.

If you have any questions regarding this project, or require any further assistance with this or any other project, please do not hesitate to contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Anacer

Adam Holzhauser Senior Geotechnical Engineer

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Figure 1	Test Pit Location Plan – Site 1
Figure 2	Test Pit Location Plan – Site 2

Appendices

- Appendix A Results of Field Investigations
- Appendix B Laboratory Test Results
- Appendix C Pavement Thickness Design Sheet



1 INTRODUCTION

This report presents the results of geotechnical investigations and assessment undertaken by Regional Geotechnical Solutions Pty Ltd (RGS) for the proposed intersection and turning lanes to be constructed on a section of the Gwydir Highway approximately 15km to the west of Glen Innes NSW.

The new intersection and associated east and west bound turning lanes are required to enable access to a proposed new wind farm and quarry. The quarry will provide material to the wind farms being constructed in the Glen Innes area and will also be used long term by Council for other applications once the windfarms are constructed.

Initially two alternative locations were considered for the new intersection (refer to Diagram 1), with investigations undertaken at both these locations. The preferred location at the time of the investigations was Site 1, however since the investigation Site 2 has been chosen for the site of the new intersection. In this regard the results of the investigations for both sites have been included within this report for information only. The comments and recommendations provided herein are related to Site 2.

The intersection will include:

- A new road to the south of the Gwydir Highway to provide access to one of the proposed wind farms and the proposed new quarry;
- Widening of the east bound lane of the Gwydir Highway to enable the construction of a left hand turning lane onto the new access road;
- Widening of the east bound lane of the Gwydir Highway to enable the construction of a merging lane when exiting the access road west bound onto the Gwydir Highway; and
- Widening of the east bound lane off the Gwydir Highway to enable the construction of a right hand turning lane into the new access road.





Diagram 1: Site Location

The purpose of the geotechnical assessment is to provide the following:

- An assessment of the subsurface conditions below proposed pavements;
- An assessment of subsurface conditions below the existing highway shoulder where new turning lanes are proposed;
- An assessment of existing highway pavement profile;
- Pavement thickness designs for the new sections of pavement; and
- Recommendations on pavement construction, including subgrade preparation tying in of new and existing pavements and drainage recommendations.

2 FIELD WORK

Fieldwork for the assessment was undertaken on August 2016 and comprised the following:

- An initial walkover assessment of each site, involving the visual assessment of site conditions near the proposed intersection and assessment of existing pavement surface conditions.
- The excavation of test pits including:
 - Eight test pits at Site 1; and
 - Two test pits at Site 2.



• Collection of samples from the test pits for laboratory testing as detailed in Section 3.

The site walkover, test pitting and logging was undertaken by a Senior Geotechnical Engineer from RGS. Engineering logs of the test pits are presented in Appendix A. The approximate test locations are presented on Figure 1 (Site 1) and Figure 2 (Site 2).

3 LABORATORY TESTING

Samples collected during the fieldwork were sent to a NATA registered geotechnical testing laboratory where the following testing was undertaken.

<u>Site 1</u>

- Six Moisture content tests;
- Two Particle Size Distribution (PSD) on the existing pavement gravel;
- Two Atterberg Limits tests on the existing pavement gravel;
- Two CBRs on the existing pavement subgrade;
- Two CBRs on subgrade material below the proposed pavements.

<u>Site 2</u>

• Two CBRs on the existing pavement subgrade.

The laboratory testing was undertaken in accordance with the relevant RMS test methods. The results of the laboratory testing are presented and discussed in Section 4.3. A copy of the laboratory test results sheets is provided in Appendix B.

4 SITE CONDITIONS

4.1 Site location and Surface Conditions

The proposed works are located on the Gwydir Highway approximately 15km to the west of Glen Innes as illustrated in Diagram 1 and is situated at an elevation of approximately 1,100m. The area is characterised by gently to moderately undulating residual topography. Site 1, the primary subject of this report is located on a gently sloping north facing hill of about 2 to 3°.

The Google Earth image in Diagram 2 illustrate the site setting.



Diagram 1: Site Location



The Gwydir Highway runs in a general east west direction, traversing a north facing slope and rising to the west at about 1°. A row of mature poplars, approximately 10m from the road shoulder, line the northern side of the highway.

The road is formed near grade over the eastern extents transitioning into cut over the western extent to the west of the proposed intersection. A large well defined unlined table drain is located along the southern upslope side of the road, with an invert level below that of the pavement formation. The northern shoulder and verge fall to the north away from the pavement formation. The pavement is well drained.

The highway is in good condition and appears to have been upgraded sometime in the past five years or so. The pavement is sealed to approximately 0.5m outside the fog line, with the shoulders graded away from the pavement formation.

Selected site photographs are provided below.



Plate 1: Selected Site Photographs



4.2 Subsurface Conditions

The 1:250,000 series geological series sheet for Grafton (SH 56-6) indicates the area is underlain by Tertiary volcanics comprising basalt and dolerites. The image below represents the Google Earth image of the site overlain by the geological series map.





Diagram 3: Geological Series Map overlain on Google Earth Image

Detailed descriptions of the conditions encountered at Site 1 and Site 2 are provided in the engineering logs presented in Appendix A. A summary of the subsurface conditions encountered at Site 2 is provided below.

<u> Site 2 – TP9 & TP10</u>

Wearing Surface: Two coat spray seal 20mm thick.

Pavement: Gravelly sand varying between 0.05m (TP9) and 0.08m (TP10) thick. The pavement material was heavily bound and appeared to be stabilized with a cementitious product.

Fill Subgrade: Gravelly clay and gravelly sand was encountered below the pavement and extended to 0.38m and 0.28m in TP9 and TP10 respectively. The material appeared to be stabilized – possibly with lime.

Natural Subgrade: The natural subgrade comprised residual clays, medium plasticity, very stiff to hard in TP9, while in TP10 residual sand and gravel, dense to very dense, were encountered below the fill. Silty clay, medium plasticity, hard was encountered below the sand and gravel at 0.75m.

Photographs of the test pit excavations are presented in Plate 2.



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No Groundwater seepage was encountered during the excavation of the test pits.

4.3 Laboratory Test Results

The laboratory test results are presented in Appendix B. The following tables provide a summary of these results. The results of testing undertaken on samples recovered from Site 1 have also been include to provide a more detailed assessment of overall conditions and variation in the materials.

Sample Location	Test Pit	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Moisture Content (%)
	TP2	0.4 to 0.8				39.2
	TP3	0.5 to 0.75				28.6
Site 1	TP4	0.05 to 0.25	18	16	2	7.7
3116 1	TP5	0.3 to 0.5				43.9
	TP7	0.05 to 0.25	19	17	2	10.2
	TP7	0.6 to 0.75				43.0

Table 1.	Atterberg Limits an	nd Moisture Conte	ont Test Results
	Alleiberg Linnis an		



Table 2: CBR Test Results												
Sample Location	Test Pit	Sample Depth (m)	Material type	Natural Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (t/m³)	CBR (%)					
	TP2	0.4 to 0.8	Clay (medium plasticity)	39.2	31.4	1.43	4.0					
Site 1	TP3	0.5 to 0.75	Gravelly Clay (medium plasticity)	28.6	19.8	1.74	25.0					
Sile I	TP5	0.3 to 0.5	Clay (medium plasticity)	43.9	36.5	1.33	5.0					
	TP7	0.6 to 0.75	Gravelly Clay (medium plasticity)	43.0	44.1	1.21	16.0					
5 ¹¹ - 0	TP9	0.5 to 0.75	Clay (medium plasticity)	31.4	26.3	1.58	6					
Sile 2	TP10	0.75 to 1.0	Clay (medium plasticity)	28.8	27.9	1.52	13					



	% Passing						
Sieve Size	TP 4 0.05 – 0.25	TP7 0.05 – 0.25					
75mm	100	100					
53mm	89	100					
37.5mm	85	100					
26.5mm	79	99					
19mm	75	95					
13.2mm	71	89					
9.5mm	66	85					
6.7mm	61	81					
4.75mm	56	76					
2.36mm	49	69					
425µm	27	41					
75µm	14	21					

 Table 4:
 Summary of Particle Size Distribution Testing

5 GENERAL SITE CONDITIONS AND GEOTECHNICAL CONSIDERATIONS

The proposed intersection is located within residual topography on a north facing slope that is generally well drained. The existing Gwydir Highway appears to have been upgrade in the past 5 years or so and is in good condition with only minor flushing observed within the wheel paths of both the east and west bound lanes. The investigations indicate that the existing pavement is heavily bound and comprises a 20mm two coat seal over a thin 0.05 to 0.08mm thick cement stabilized gravely sand, over possibly lime stabilized gravelly clay and gravelly sand to 0.38m and 0.28m in TP9 and TP10 respectively. The pavement subgrade includes residual clay, sand and gravel soils.

The new wind farm and quarry access road off the Gwydir Highway will be formed near to existing grade.

The proposed intersection upgrade works which will include widening to accommodate new turning and merging lanes.

While the new intersection will not result in an increase to existing general traffic use of the Gwydir Highway, it will result in a short term increase during the construction phase of the windfarm and an increase in heavy vehicle use both during and post construction phase. The increase in heavy vehicle use will be as a result of the long term quarry operations.



6 PAVEMENT DESIGN

6.1 Design Traffic

The pavement designs presented herein were prepared on the basis of Equivalent Standard Axles (ESA) assessed on the basis of the traffic impact assessment undertaken for the project and data provided by Glen Innes Council.

The traffic impact assessment for the project was undertaken by Bitzois Consulting (Project Number P2249 dated 2 February 2016). The report indicates the following:

- An average annual daily traffic of 1272 vehicles per day;
- 50:50 traffic spilt east west bound;
- 1.5% annual traffic growth;
- Percentage of heavy vehicles has not been provided in the report, therefore for the purpose of the assessment presented herein a value of 12% has been adopted.

The report also indicates that traffic impact will be "minor" during the operational phase of the windfarm. It is anticipated that infrequent access to the windfarm will be required during the operational phase for maintenance purposes.

The most significant increase in traffic will be during the construction phase of the wind farm project, which is understood to be 36 weeks. Peak traffic volumes during the construction phase are expected to be approximately 210 vehicle trips per day with the peak expected to occur over a 15-week period. Light vehicle movement during this period is expected to be in to the site in the morning and leaving in the afternoon, while heavy vehicle movement will be spread evenly throughout the 10 hour working day. At this point the majority of the construction traffic is expected to travel to and from the site from Glen Innes.

Glen Innes council has indicated that the Quarry will result in 120 truck movements per day, comprising 50:50 distribution in and out. The trucks will comprise ridged body trucks with dog trailer.

On the basis of the above the following design traffic loads have been calculated:

Gwydir Highway Intersection - 4.4 x 10⁶ ESAs

New Access Road - 1.2 x10⁶ ESAs

The pavement thickness design presented herein is for a 40 year design life.

6.2 Subgrade California Bearing Ratio Testing

Two CBR tests were undertaken on the expected subgrade materials, which comprise residual silty clays of medium plasticity. The testing indicates CBR values of 6% and 13% for TP9 and TP10 respectively. Based on this testing a CBR value of 6% is considered appropriate for the pavement thickness design, howvere RMS have requested that a design CBR of 4% is adopted.

6.3 Evaluation of Existing Gwydir Highway Pavement

The existing pavement profile varies between 0.28m and 0.38m and appears to comprise a heavily bound upper profile, 0.05 to 0.08m thick, of cement stabilized gravelly sand over lime stabilized gravelly clay and gravelly sand.

Visual assessment of the pavement surface indicates it is generally in good condition, possibly having been upgraded in the past 5 years or so.



The existing pavement appears to be performing well but does not appear to comply with current design requirements.

6.4 Summary of Pavement Options and Preferred Pavement Type

There are a number of possible pavement options that could be adopted for the proposed works. The existing pavement is a heavily bound pavement and in this regard our preference is to adopt a similar bound pavement for the proposed works. A bound pavement is also recommended for the initial section (approximately 20m) of the new access road to tie in with the Gwydir Highway Works. The pavement sections in the vicinity of the intersection will be subjected to high braking and acceleration loads and high screwing loads from turning vehicles, particularly heavily loaded trucks.

The existing pavement comprises a 2 coat seal, however an AC wearing surface at least 30mm thick would provide a more durable surface to a spray seal at the intersection where high braking, acceleration and in particular screwing loads will be generated.

A bound pavement thickness design was undertaken using CIRCLY based on the pavement design data presented and discussed above.

RMS have requested that an unbound flexible pavement with two coast seal wearing surface is adopted for the upgrade works, therefore the design presented in presented in Appendix C has been undertaken on this basis.

7 PAVEMENT CONSTRUCTION

7.1 Construction Methodologies

The existing highway will need to be widened to accommodate the turning and merge lanes and exit to the access road. There is the potential for differential movements to occur between the existing and newly constructed sections of pavement possibly resulting in longitudinal cracking or deformation near the interface. Consideration will need to be given to this aspect of construction to appropriately tie the newly constructed sections with existing. The adoption of a similar pavement profile (bound payment) should help towards alleviating this potential issue.

Formation widening should be constructed as follows:

- Remove all vegetation and relocate and existing services as required.
- Strip existing topsoil and unsuitable materials from the existing verge and table drains for later reuse in landscaping areas.
- Following excavation to an appropriate foundation level, proof roll to identify any wet, excessively deflecting or heaving material. Any such areas should be over-excavated down to a stiff foundation and backfilled with a clean select material. Some soft, unsuitable areas may be encountered within the table drains where water ponds.
- Excavate level benches at least 500mm wide and no greater than 300mm high into the side of the slopes to tie in the new formation with the existing.
- Place approved fill in layers not exceeding 300mm loose thickness. Compact to a minimum dry density ratio of not less than 98% Standard Compaction. The upper 300mm of the fill layer directly below the pavement profile should be compacted to 100% Standard



Compaction. Fill should be placed and maintained at $\pm 2\%$ of standard OMC. The use of granular fill is preferred. Appropriate fill could include granular material or approved residual soils sourced from other areas of the site. Where clay fill is used more stringent earthworks control will be required. Clay fill should not be used within 0.5m of the bottom of the pavement (i.e. granular fill should be used over the upper 0.5m below the pavement).

- The road formation should be constructed with sufficient width to accommodate appropriate shoulders and to enable compaction near the edge of the formation.
- Construct pavements as outlined below and as per design requirements (Appendix C).

The following construction methodology is recommended for the pavements:

- Saw cut existing pavement at a location that will lie outside the wheel path of the reconstructed pavement.
- Construct appropriate bench in existing pavement profile to eliminate continuous vertical joints at the interface of the existing and new sections of the pavement.
- Construct pavement interface drain as per design drawings.
- Place new pavement over prepared subgrade as per design requirements as specific in pavement thickness design sheet presented in Appendix C.
- Place two coat seal.

Pavement construction, including sealing, should extend well beyond the outer wheel path of the pavement to provide lateral restraint to the outer wheel path and to assist in preventing ingress of moisture through the road shoulder.

7.2 Fill Materials

Materials recommended for use as engineered fill include good quality well graded granular materials (such as crushed or ripped rock), free of deleterious materials and having a maximum particle size of 100mm. Site won soils can be reused where appropriate as a general fill material including within the lower fill layers of the drainage channels.

The use of clay soils will require more rigorous earthwork monitoring and compaction control, more time drying out the soils, increased potential for delays due to inclement weather and as such greater eventual cost to earthworks compared with weathered rock materials.

Select material should meet the requirements of RMS Specification 3071 and be placed in accordance with RMS specification R44. Pavement materials should comprise DGB20 as per RMS Specification 3051 placed in accordance with RMS specification R71.

8 PAVEMENT DRAINAGE

The provision of adequate surface and subsurface drainage is critical to long term pavement performance, and should be considered in the design and construction of all pavements. As a minimum suitable cross-falls should be maintained both during and following construction. Table drains and / or kerb and guttering should be constructed along both sides of the pavements where appropriate. Invert levels of table drains should be constructed below the level of the pavement



profile. All drains should be constructed in a manner to promote rapid drainage and discharge away from the pavement.

Table drains are likely to be feasible but where it is not possible to construct table drains or they are not the preferred option, alternatives such as subsoil drains can be used. Subsoil drains should be constructed along the upslope side of the Gwydir Highway pavement and on both sides of the access road, which is oriented down slope. The invert level of the drains should be similar to the thickness of the pavement profile. Subsoil drains should discharge to an appropriate storm water drain down slope of the pavement formation.

It is recommended that the pavement and pavement seal extend at least 0.5m onto the shoulder beyond the outer edge of the traffic lane to provide lateral confinement and reduce potential moisture ingress at the edge of the pavement. The pavement verge should be graded away from the centreline of the pavement and towards the pavement drains.

9 LIMITATIONS

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical and pavement design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points. If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Maacen

Adam Holzhauser Senior Geotechnical Engineer

Figures



	Title:	Test Location Plan - Site 1	Drawing No.						
GEOTECHNICAL SOLUTIONS		Gwydir Highway Glen Innes	Date:						
REGIONAL	Project:	Proposed Highway Intersection and Turning Lane Upgrade	Drawn By:						
	Client	Client Local Government Engineering Services							

HOOKET	
FIGURE 1	
20-Sep-16	
Adam Holzhauser	
RG\$30969.1	



	Client	Local Government Engineering Services	Job No.	
REGIONAL	Project:	Proposed Highway Intersection and Turning Lane Upgrade	Drawn By:	
GEOTECHNICAL SOLUTIONS		Gwydir Highway Glen Innes	Date:	
	Title:	Test Location Plan - Site 2	Drawing No.	



Appendix A

Results of Field Investigations

	ENGINEERING LOG - TEST PIT											TEST PIT NO: TP1				
F	REG	SIONA	۱L	c	LIENT	:	Local Government Engineering Ser	vices		P	AGE	:	1 of 1			
GE	OTECH	NICAL SOLUT	IONS	P	ROJE	CT NA	ME: Proposed Highway Intersection			J	OB	NO:	RGS30969.1			
1				S	ITE LO	CATI	ON:			L	OGG	BED B	Y: AH			
				т	EST L			D	ATE	:	3/8/16					
E			'E:	Shove	l/Hand	l Auge	r EASTING:		9			RL:				
<u> </u>	-51 P		H:	0.5 M	W		0.5 m NORTHING:			JATU	VI:	17.1	AHD			
-	Dri	lling and Sar	mpling			7	Material description and profile information				Field	a rest				
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIO SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity characteristics,colour,minor component	//particle s	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Structure and additional observations				
Shovel		-		-			TOPSOIL: Gravelly SILT, low plasticity, darl brown, gravel is fine to coarse subangular b rootlets	k grey basalt with	M > w _P				TOPSOIL: Weed cover Seepage through Topsoil			
				-		CL	Silty CLAY: Medium plasticity, dark grey, bu a trace of fine to coarse basalt gravel	rown with	M > Wp	F			RESIDUAL			
Datgel Lab and In Situ Tool HA	₹ 					СН	<u>0.50m</u> Silty CLAY: Medium to high plasticity, dark brown 1.15m		M > Wp	F - St St						
KEHOLE - LEST PIT KGS30969.1 DKAPT.GPJ <	GEND					nd Test	Hole Terminated at 1.15 m Practical Refusal on Extremely Weathered I	Basalt				CS (kPPs	1) Moisture Condition			
	LEGEND: Notes. Sam; Water U₀₀ ✓ Water Level (Date and time shown) E ► Water Outflow ▲ Water Outflow Strata Changes Field Tests Gradational or Transitional strata PID					n Diame sample f ponmenta Sulfate S Sample	- er tube sample or CBR testing I sample oil Sample n detector reading (ppm) tromotor tot (foot double integral objects)	VS V S S F F St S VSt V H H Fb F Density	ery Soft oft irm tiff ery Stiff ard riable V L	Ve	<2 25 50 10 20 >4 ery Lo pose odium	225 5 - 50 0 - 100 00 - 200 00 - 400 400 000se	D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35%			
3G LIB 1.	Definitive or distict strata change DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)									De Ve	edium ense ery De	i Dense	 Density index 35 - 65% Density Index 65 - 85% Density Index 85 - 100% 			

	ENGINEERING LOG - TEST PIT													TEST PIT NO: TP2						
IF	REG	SIONA	4L	/ c		:		Local Go	overnment	Engineering	g Serv	vices		P	AGE	:		1 of 1		
ĠE	OTECH	NICAL SOLUT	riòns	Р	ROJE		ME:	Propose	d Highway	Intersection	۱			J	ов і	NO:		RGS30969.1		
-			_//	s	ITE LO	OCATI	ON:							L	OGC	GED B	Y:	AH		
				т	EST L	OCAT	ION:	Refer to	Figure 1					D	ATE	:		3/8/16		
EQUIPMENT TYPE: 7.5T Excavator								0.5 m		EASTIN	G:		:	SURF	АСЕ м.	RL:		TP2 1 of 1 RGS30969.1 AH 3/8/16 AHD Structure and additional observations PSOIL/FILL: Weed Cover L SIDUAL TREMELY WEATHERED SALT		
<u> </u>	Dril	ling and Sar	molina	2.4 111				Material des	cription and		tion				Field	d Test		,		
						z														
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIC SYMBOL	м	ATERIAL DI charac	ESCRIPTION teristics,colo	I: Soil type, pla ur,minor comp	asticity/ onents	/particle	MOISTURE CONDITION	CONSISTENC) DENSITY	Test Type	Result	Structi	ure and additional observations		
ш	ered					8		TOPSOIL/	FILL: Clayey	SILT, low plas	sticity, g	grey,	Š				TOPSOIL	/FILL: Weed Cover		
	count			-		Š		DIOWITWIUT	Some line to	coarse graver	I		έ							
	t Enc					<pre>X</pre>														
	Not			-		×	0.20m	FILL: Sand	JV GRAVEL.	medium to coa	arse ar	rained	<u>م</u>	-			FILL			
						X	0.30m	subangular	r, grey		Ū		^ ^							
				-		CL		Silty CLAY	: Medium pla	asticity, orange	e, brow	n with a	× ∎	St			RESIDUA	AL.		
		0.40m		-				liace of me		se sanu			Ξ		HP	100				
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		DB		-																
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0				-																
I Situ T				1.0			1.00m													
and Ir						CL		Silty CLAY	: Medium pla	asticity, pale gr	ey, mo emelv	ottled to highly	× ×	н			EXTREM BASALT	ELY WEATHERED		
jel Lab				-				weathered	ad gravel ≥											
4 Dato																				
3.30.00				-			1 25m													
6:13							1.2011	Hole Termi	inated at 1.28	5 m										
2016 1																				
80/60				-	-															
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awingf				1.5	-															
Ū V																				
T.GP.				-]															
1 DRA				-																
0969.1																				
RGS3																				
T PIT																				
- TES				-	1															
EHOLE						<u> </u>												A 1111		
	GEND: ater			<u>Notes, Sa</u>	mples a	and Tes	<u>ts</u>					Consister VS \	ncy /ery Sof	t	<u>U</u> <2	<u>CS (kPa</u> 25	∎) <u>Moistu</u> D	Ire Condition Dry		
	Wa	ter Level		U₅₀ CBR	50mn Bulk (n Diame sample f	eter tub for CRI	e sample R testing				S S F F	Soft Firm		25 50	5 - 50) - 100	M W	RGS30969.1 AH 3/8/16 AHD Structure and additional observations OPSOIL/FILL: Weed Cover LL SIDUAL CTREMELY WEATHERED ASALT CTREMELY WEATHERED ASALT Density Index <15% Density Index <15% Density Index 35 - 65% Density Index 85 - 100%		
NON-C	(Da	te and time s	shown)	E	Envir	onmenta	al sam	ple				St St	Stiff		10	0 - 200	W _p	Plastic Limit		
g RG	◀ Wa	ter Outflow		B B	Bulk	Sunate S Sample	JUII SA	mple					lard		20	10 - 400 100	VVL	τιαιία τιμιτ		
Str	ata Ch	anges		Field Test	s						ŀ	Fb F Densitv	riable V	V	erv Lo	ose	Density	v Index <15%		
04.3.G	G tr	ansitional or	ata	PID	Photo	oionisatio	on dete	ector reading	(ppm)	chows)			L		DOSE	0 Dor-	Density	y Index 15 - 35%		
LIB 1.	D	efinitive or di trata change	istict	DCP(x-y) HP	Dyna Hand	Penetro	etrome ometer	er test (test) test (UCS kF	ueptn interval Pa)	snown)			ME D	א כ D	iediun ense	n Dense	e Density Density	y Index 35 - 65% y Index 65 - 85%		
5 2 2	strata change Hand Penetrometer test (UCS kPa)										VE) V	ery De	ense	Density	y Index 85 - 100%				

				Ē	LOG - TE	EST PIT				т	EST	PIT N	io: TP3			
R	EG	SIONA	٩L	/ c	LIENT	:	L	ocal Govern	ment Engine	ering Ser	vices		Р	AGE	:	1 of 1
GE	OTECHI	NICAL SOLUT	TIÒNS	Р	ROJE	CT NA	ME: F	roposed Hiç	hway Interse	ction			J	ові	NO:	RGS30969.1
-			_//	s	ITE LO	CATI	ON:						L	OGG	GED B	Y: AH
				т	EST L	OCAT	ON: F	Refer to Figu	re 1				D	ATE	:	3/8/16
EC TE	QUIPN ST P	MENT TYP	'E: H:	7.5T E 1.4 m	xcava W	tor IDTH:	0.5	m	EAS	sting: Rthing:		؛ ا	SURF	ACE M:	RL:	AHD
	Dril	ling and Sar	mpling				Mat	terial descriptio	n and profile info	ormation				Fiel	d Test	
						Z							۲			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATI SYMBOL	MATE	ERIAL DESCR characteristic	IPTION: Soil typ s,colour,minor o	e, plasticity components	/particle s	MOISTURE	CONSISTENC DENSITY	Test Type	Result	Structure and additional observations
ш	tered						SF	PRAY SEAL: 1	5-20mm							WEARING SURFACE
	count	0.10m	-	-												
							^{0.15m} Fl ar wi	LL: Sandy GR/ Igular basalt, gi th gravel up to	AVEL, fine to co rey, sand is fine approx 50-60m	arse graine to coarse g m	ed grained	M	VD			PAVEMENT GRAVEL
							0.35m Fl	LL: Gravelly C	LAY. medium pl	asticitv. mo	ttled	м				FILL SUBGRADE
				-		*	br co	own and orang barse angular b	e brown, gravel asalt and ironste	is medium	to			HP	600	
		0.50m		0. <u>5</u>		*										
						*										
		DS		-												
				-												
		0.75m	-				0.75m						St.			
				-		UL	on	ange brown, gr	avel is fine to co	arse subar	ngular	∧ ∧	VSt	HP	450	
				_			De		one							
u Tool																
d In Sit				1. <u>0</u>												
Lab an							1.10m									
Datge							Ho	ole Terminated	at 1.10 m							
0.004				-	-											
13 8.3																
016 16:				-												
9/08/2				_	-											
le>> 0																
awingFi				1. <u>5</u>												
*^Drs																
T.GPJ				-	1											
1 DRAF				-	-											
30969.																
T RGS				-												
STPI				_												
- 11 -																
LE	GEND:		L	Notes, Sa	mples a	nd Test	<u>s</u>				Consiste	ency		<u>U</u>	 CS (kPa	a) Moisture Condition
	iter			U ₅₀	50mm	n Diame	er tube sa	ample			VS V S S	√ery Soft Soft		<2 25	25 5 - 50	D Dry M Moist
N-COL	- Wa (Da	ter Level ite and time s	shown)	CBR	Bulk s	ample f	or CBR te	sting			F F	Firm Stiff		50) - 100)0 <u>- 200</u>	W Wet
MG NC	Water Inflow Ass Acid Sulfate Soil Sample				e			VSt V	Very Stiff		20)0 - 200)0 - 400	W _L Liquid Limit			
bold Str	Water Outflow B Bulk Sample Strata Changes						H H Fb F	⊣ard Friable		>2	+00					
L3.GLE	Gradational or transitional strata Field Tests PID Photoionisation detector reading (ppm)								Density	V L	Ve	ery Lo bose	oose	Density Index <15% Density Index 15 - 35%		
IB 1.04	ני D	efinitive or di	aid istict	DCP(x-y) нр	Dynar	nic pen	trometer	test (test depth i	nterval shown)			ME) M	ediun	n Dense	Density Index 35 - 65%
RG LI	S	Definitive or distict DCP(x-y) Dynamic penetrometer test (test depth interval shown) strata change HP Hand Penetrometer test (UCS kPa)								U VD	U Vi	ense ery De	ense	Density Index 05 - 85% Density Index 85 - 100%		

				E	NGI	NEE	RING LOG - TEST	PIT			т	EST	PIT N	io: TP4
F	REC	GION	١L	C C	LIENT	:	Local Governmer	t Engineering Ser	vices		Р	AGE		1 of 1
G	EOTECI	INICAL SOLUT	IÙNS	P	ROJE	CT NA	ME: Proposed Highwa	y Intersection			J	OB	NO:	RGS30969.1
11				s	ITE LC	CATI	ON:				L	OGG	GED B	BY: AH
				т	EST LO	OCAT	ON: Refer to Figure 1				D	ATE	:	3/8/16
E	QUIP	MENT TYP	'E: H:	7.5T E 1.8 m	xcava W	tor IDTH:	0.5 m	EASTING: NORTHING:		: 		ACE M:	RL:	AHD
H	 D	rilling and Sar	mplina				Material description and	profile information				Field	d Test	
						z					~	TION		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIC SYMBOL	MATERIAL DESCRIPTIC characteristics,col	N: Soil type, plasticity our,minor component:	/particle s	MOISTURE CONDITION	CONSISTENC ^V DENSITY	Test Type	Result	Structure and additional observations
Ц	tered	0.05m	-		~~~~		0.05m SPRAY SEAL: 30mm							
	Not Encount	DB <u>0.25m</u>		-			FILL: Sandy GRAVEL angular basalt, grey w	, fine to coarse graine ith a trace to some co	ed bble	M	VD			PAVEMENT GRAVEL
				0. <u>5</u>			FILL: Sandy CLAY, m orange brown, sand is fine to medium gravel	edium plasticity, brow fine to coarse with a	n and trace of	M > W				FILL SUBGRADE
		0.60m		-		СН	Silty CLAY: Medium t	o high plasticity, brow	n,	× Kp	н	HP	500	RESIDUAL
ab and In Situ Tool.		0.60m DB 0.80m 1.0 1.0					orange brown and gre	y brown		×		нР	500	
NON-CORED BOREHOLE - TEST PIT RGS30999.1 DRAFT.GPJ < <drawingfile>> 09/08/2016 16:13 8.30.004 Datge</drawingfile>	EGENI Later (DD	D: ater Level late and time s	hown)	- - 1.5_ - - - - - - - - - - - - - - - - - - -	mples a 50mm Bulk s Envirc	nd Test	Hole Terminated at 1.	10 m	Consister VS V S S F F St S	ncy ery Soft oft tiff		U <22 50 10	CS (kPa 55 5 - 50 0 - 100 00 - 200	a) Moisture Condition D Dry M Moist W Wet W _p Plastic Limit
IB 1.04.3.GLB Log KG N	(Date and time shown) E → Water Inflow ASS → Water Outflow B Strata Changes Gradational or transitional strata Definitive or distict HP		ASS B Field Test PID DCP(x-y) HP	Acid S Bulk S S Photo Dynar Hand	Sulfate S Sample ionisationisation	oil Sample n detector reading (ppm) trometer test (test depth intervi-	al shown)	VSt V H H Fb F <u>Density</u>	ery Stiff ard riable V L ME	Vi La D M	20 >4 ery Lo pose edium	00 - 400 400 pose n Dense	W _L Liquid Limit Density Index <15% Density Index 15 - 35% e Density Index 35 - 65% Density Index 65 85%	
RGL	Definitive or distict DEFi Strata change						····			VD	v V	ery De	ense	Density Index 85 - 100%

				E	NGI	NEE	RIN	G LOG - TEST PIT			т	EST	PIT N	o: TP5
I R	FG		71	<u>с</u>		:		Local Government Engineering Ser	rvices		Р	AGE	:	1 of 1
ĠE	DTECHN	NICAL SOLUT	IÒNS	P	ROJE	CT NA	ME:	Proposed Highway Intersection			J	OB I	NO:	RGS30969.1
-				s	ITE LO	CATI	ON:				L	OGC	GED B	Y: AH
				т	EST L	OCAT	ION:	Refer to Figure 1			D	ATE	:	3/8/16
EC	QUIPN		E:	7.5T E	Excava	tor		EASTING:		5	SURF	ACE	RL:	
ТЕ	ST PI	IT LENGT	H:	2.5 m	W	IDTH:	0	0.5 m NORTHING:		[DATU	M:		AHD
	Drill	ling and Sar	npling				Ν	Material description and profile information				Fiel	d Test	
					0	NOI				l z	ζ	0		.
ЬH	TER	SAMPLES	RL	DEPTH	BHIG	FICAT ABOL	MA	ATERIAL DESCRIPTION: Soil type, plasticity	y/particle	STURI	STEN	Type	sult	Structure and additional observations
MET	WA		(m)	(m)	GRA	ASSIF		characteristics,colour,minor component	ts	MOIS	ONSIG	Test	Re	
	<u> </u>					CL					ŏ			
"								TOPSOIL: Clayey SILT, low plasticity, dark	brown	× ×				TOPSOIL:GRASS
				-	- } }					Σ				
						CL	0.15m	Silty CLAY: Medium plasticity, orange brow	vn with a	Š	St -		050	RESIDUAL
		0.25m		-				trace of coarse sand		^ E	VSt	HP	250	
				-										
		DB		-										
		0.50m		0.5										
			1											
				-										
				-								HP	300	
						CL	0.75m	Silty CLAY: Medium plasticity, grey brown	with	ת.	VSt			Grading into EXTREMELY
				-				some coarse sand and fine basalt gravel		× ×		HP	350	WEATHERED BASALT
				-										
					}		0.95m	BASALT: Fine grained grey and dark grey	highly			-		HIGHLY WEATHERED
				1.0_	kX			fractured	, mginy					BASALT LOW STRENGTH Excavates as a medium to
					$ \leq\leq$									coarse angular gravel with
				-	$\langle \rangle \rangle \rangle$									
				-	<u>k</u> X									
				-	$\langle \rangle \rangle \rangle$									
					$\left \right\rangle$									
				-	\mathbb{K}									
þ				1. <u>5</u>	$\langle \rangle \rangle \rangle$									
					$\langle \rangle \rangle$									
				-	$\langle \rangle \rangle$									
					$\langle \rangle \rangle \rangle$									
				-	KX									
L	_				KK		1.80m			-				
								Hole Terminated at 1.80 m Refusal on Highly to Moderately Weathered	d low to					
				-	-			medium strength basalt						
										L				
LE	GEND:			Notes, Sa	mples a	nd Tes	<u>ts</u>		Consister	ncy erv Soft		<u>U</u> <	CS (kPa 25	Moisture Condition D Drv
	<u>⊪er</u> ⊈ Wat	ter Level		U ₅₀	50mm	n Diame	eter tube	e sample	S S	oft		25	5 - 50	M Moist
	(Date and time shown) (Date tand time shown) E Environmental sam					ample f	tor CBR al samp	R testing Dle	F F St S	ırm tiff		50 10) - 100)0 - 200	W Wet W _p Plastic Limit
Water Inflow ASS Acid Sulfate Soil Sample Water Outflow B Bulk Sample					mple	VSt V	ery Stiff ard		20 >4)0 - 400 100	W _L Liquid Limit			
Str	ata Cha	anges		Eight To 1		- an ipic			Fb F	riable				Density Index: x45%
-	Gi	radational or ansitional stra	ata	PID	<u>s</u> Photo	ionisatio	on deteo	ector reading (ppm)	Density	V L	V Lo	ery Lo bose	oose	Density Index <15% Density Index 15 - 35%
—	De	efinitive or dis	stict	DCP(x-y) HP	Dynar Hand	nic pen Penetro	etromet	ter test (test depth interval shown) test (UCS kPa)		ME D	M (ח	lediun ense	n Dense	e Density Index 35 - 65% Density Index 65 - 85%
	st	rata change								VD	V	ery D	ense	Density Index 85 - 100%

Г						NGI	NEE	RING LOG - TEST PIT			т	EST	PIT N	io: TP6
	RE	G	IONA	۱L	/ c	LIENT	:	Local Government Engineering Ser	vices		Р	AGE	:	1 of 1
Ċ	GEOTE	CHN	IICAL SOLUT	IÒNS	P	ROJE	CT NA	ME: Proposed Highway Intersection			J	OB I	NO:	RGS30969.1
					S	ITE LO	CATI	ON:			L	OGC	GED B	Y: AH
					т	EST L	OCAT	ION: Refer to Figure 1			D	ATE	:	3/8/16
1	EQUI FEST	IPM F PI	ENT TYP	E: H:	7.5T E 1.8 m	Excava W	tor /IDTH:	EASTING: 0.5 m NORTHING:		:		ACE M:	RL:	AHD
F		Drilli	ng and Sar	nplina				Material description and profile information				Fiel	d Test	
			ing and our				z				~			
		WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIC SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity characteristics,colour,minor component	y/particle is	MOISTURE CONDITION	CONSISTENC ^V DENSITY	Test Type	Result	Structure and additional observations
ľ	Ц	ered						0.05m SPRAY SEAL: 30-35mm						WEARING SURFACE
		Not Encounte			-		~	FILL: Sandy GRAVEL, fine to coarse grained brown, sand is fine to coarse grained	ed, grey	M	VD			PAVEMENT GARVEL
					-		* * * *	FILL: Gravelly CLAY, low to medium plastic grey with sand	city, dark	M > W _P		HP	600	FILL SUBGRADE
			0.50m		0. <u>5</u>			0.50m						
			DB		-		СН	Sity CLAY: Medium to high plasticity, dark brown with fine to coarse sand and fine grav	grey vel	M > W	H H	ΗP	450	RESIDUAL
			0.7011					0.75m						
d In Situ Tool					- 1. <u>0</u>		GC	Clayey GRAVEL: Medium to coarse graine angular basalt, clay is medium ti high plastic mottled grey brown and orange brown	ed city,	М	VD			EXTREMELY WEATHERED BASALT
Lab an								Hole Terminated at 1.05 m						
-CORED BOREHOLE - TEST PIT RGS30969.1 DRAFT.GPJ < <drawingfile>> 09/08/2016 16:13 8.30.004 Datgel</drawingfile>	_EGEI Nater	ND: Wati	er Level			mples a	nd Tes h Diametes	IS ter tube sample or CBR testing	Consister VSV SSFFF	ncy rery Soft		U <2 50	CS (kP2 25 5 - 50 0 - 100) <u>Moisture Condition</u> D Dry M Moist W Wet
LB Log RG NON-C	(Date and time shown) (Date and time shown) Water Inflow Water Outflow Gradational or Field Tests			Enviro Acid S Bulk S	Sonmenta Sulfate S Sample	al sample Soil Sample	St S VSt V H H Fb F	tiff ery Stiff lard riable V	V	20 20 >4	00 - 200 00 - 200 00 - 400 400	W ^v Vvet W _p Plastic Limit W _L Liquid Limit Density Index <15%		
RG LIB 1.04.3.G	Strata Changes Field Gradational or transitional strata Field Definitive or distict strata change DCF				PID DCP(x-y) HP	Photo Dynai Hand	ionisatio mic pen Penetro	on detector reading (ppm) etrometer test (test depth interval shown) imeter test (UCS kPa)		L ME D VC	Lo D M D D	ediun ediun ense ery D	n Dense ense	Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

			RIN	IG LOG - TEST PIT				т	EST	PIT N	IO: TP7				
R	FG	IONA	11	<u> </u>	LIENT	:		Local Government Engineering	J Serv	/ices		Р	AGE		1 of 1
GEO	DTECH	NICAL SOLUT	IÒNS	F	ROJE	CT NA	ME:	Proposed Highway Intersection	ı			J	ов і	NO:	RGS30969.1
-				s	SITE LO	CATI	ON:					L	ogo	GED B	Y: AH
				т	EST L	OCAT	ION:	Refer to Figure 1				D	ATE	:	3/8/16
FC			E.	7 57 6	Evcava	tor		EASTING	<u>c</u> .					DI ·	
	ST P	IT LENGT	H:	1.5 m	W	IDTH:	C	0.5 m NORTHI	NG:			DATU	M:		AHD
	Dril	ling and Sar	npling					Material description and profile informati	ion				Fiel	d Test	
						NO						۲			
Ę	ËR		RL	DEPTH	UHC DHC	CATI	М	ATERIAL DESCRIPTION: Soil type, plas	sticitv/	particle	TURE		Lype	sult	Structure and additional observations
AET	MAT	SAMPLES	(m)	(m)	LO	SSIFI		characteristics,colour,minor compo	onents	5	UN0	NSIS DEN(est	Res	
 ⁻						CLA					20	00			
ш	ered				~~~~		0.04m	SPRAY SEAL: 35mm							WEARING SURFACE
	ounte					ž		FILL: Sandy GRAVEL, fine to coarse g angular basalt, grey, sand is fine to coarse	graine arse g	d rained	М	VD			PAVEMENT GRAVEL
	Enco	DB							0						
	Not				\otimes	ž									
	0.25m														
						М	VD			FILL SUBGRADE					
						ž		brown and grey brown							
				0. <u>5</u>											
						ž	0.59m								
		0.60m				GC	0.3011	Gravelly CLAY: Medium plasticity, ora	ange b	rown,	×	н			RESIDUAL/EXTREMELY
		DS						sand is medium to coarse subangular	basalt	I	× ≥				WEATHERED BASALT
		DS 0.75m 9													
							0.85m								
					0/0/0	GC		Clayey GRAVEL: Medium to coarse g angular basalt, pale grey and orange b	grainec prown	ł	М	VD			EXTREMELY WEATHERED/HIGHLY
					0/0/	'									WEATHERED BASALT
				1.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~										
							1.05m	Hole Terminated at 1.05 m							
p i															
					-										
					-										
5															
				-	1										
b				1.5											
					-										
					1										
					1										
LE	LEGEND: Notes, Samples and Tests					<u>Cons</u> iste	ncy		U	CS (kPa	a) Moisture Condition				
Wa	Water LL 50mm Diameter tube comple		e sample		VS V	/ery Soft		<2	25 5 - 50	D Dry M Moiet					
	Wat	ter Level	hours	CBR	Bulk s	sample	for CBF	R testing		F F	Firm		25 50) - 50) - 100	W Wet
	(Da - Wat	ter Inflow	nown)	E ASS	Enviro Acid 9	onmenta Sulfate S	al samp Soji Sa	ple Imple		St S VSt V	Stiff /erv Stiff		10 20)0 - 200)0 - 400	W _p Plastic Limit W, Liquid Limit
	Water Outflow B Bulk Sample			r -		H H	lard		>4	400					
Str	Strata Changes Gradational or Field Tests				ŀ	⊢b F Density	riable V	V	ery Lo	ose	Density Index <15%				
-	PID Photoionisation dete			ector reading (ppm) eter test (test depth interval shown)			L	Lo) M	oose edium	n Dense	Density Index 15 - 35%				
	— D st	transitional strata Definitive or distict strata change HP Hand Penetrometer				ometer	test (UCS kPa)			D	D	ense		Density Index 65 - 85%	
		-									VD	V	ery De	ense	Density Index 85 - 100%

RG LIB 1043 GLB Log RC NON-CORED BOREHOLE - TEST PIT RGS30969.1 DRATT.GPJ <</r>

						RING LO	DG - TEST P	IT			Т	EST	PIT N	o: TP8		
l F	RF	G		11		LIENT	:	Loca	al Government E	ngineering Ser	vices		P	AGE	:	1 of 1
G	EOTE	CHN	ICAL SOLUT	IONS	F	ROJE	CT NA	ME: Prop	osed Highway Ir	ntersection			J	ові	NO:	RGS30969.1
-					5	SITE LO	CATI	ON:					L	OGG	ED B	Y: AH
					T	EST L	OCAT	ON: Refe	er to Figure 1				D	ATE	:	3/8/16
F	QU	IPM		E:	7.5T I	Excava	tor			EASTING:		5	SURF	ACE	RL:	
Т	EST	ΓΡΙ	T LENGT	H:	1.1 m	W	IDTH:	0.5 m		NORTHING:		I	DATU	M:		AHD
		Drilli	ing and Sar	npling				Materia	I description and pro	ofile information				Fiel	d Test	
						0	NOI .					щZ	λČ	ø		Structure and additional
THO		ATEF	SAMPLES	RL (m)	DEPTH	APHI 0G	IFICA MBOL	MATERIA	AL DESCRIPTION:	Soil type, plasticity	y/particle	STUR	ISTEN NSIT)	t Typ	esult	observations
μ		Š			()	GR	LASS SY	Ci			.0	NON CON CON	CONS	Tes	Я	
ш	-	ed					Ö	0.03m SPRA	Y SEAL: 30mm				-			WEARING SURFACE
		unter					ž	FILL:	Gravelly SAND, me	dium to coarse gr	ained,	М	VD			PAVEMENT GRAVEL
		Enco					×	grey b	rown, gravel is tine	to coarse angular						
		Not E					ž									
							ž									
								0.30m FILL:	Gravelly SAND, fine	to coarse graine	d, grey	М	MD -			FILL SUBGRADE
			0.40m				× ×	brown cobble	, gravel is medium t es and small boulde	o coarse angular rs up to 300mm d	with liameter		D			
							×									
					0.5		×									
			DB													
							× ×									
-			0.75m				×	0.75m Hole 1	Ferminated at 0 75 n	n						
						1										
L Tool																
d In Siti					1. <u>0</u>	-										
-ab and																
Datgel L						1										
.004																
3 8.30																
6 16:1						-										
/08/201																
60						1										
vingFile					1.5	4										
< <draw< th=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></draw<>																
GPJ <						-										
IRAFT.																
969.1 E						1										
(CS30						-										
PIT F																
- TES1						1										
HOLE																
N BORE	EGEI /ater	ND:			Notes, Sa	amples a	nd Tes	<u>s</u>			VS V	<u>ncy</u> ery Soft		<u>U(</u> <2	25 (kPa 25	Moisture Condition D Dry
SOREL SOREL		Wate	er Level		U₅₀ CBR	50mn Bulk s	n Diame	er tube sampl	e 1		S S	oft irm		25 50	5 - 50) - 100	M Moist W Wet
NON-C		(Dat	e and time s er Inflow	hown)	E	Enviro		I sample	2		St S	tiff		10	10 - 200	W _p Plastic Limit
g RG	-	Wat	er Outflow		B	Bulk S	Sample	on Sample				ery Stiff ard		20	iu - 400 100	vv _L Liquia Limit
SIB L	Strata Changes Gradational or Field Tests					Fb Fi Density	riable V	Ve	ery Lo	ose	Density Index <15%					
.04.3.(Graduational of transitional strata PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic genetrometer test (test depth interval shown)				iown)		L MF	Lo) M	oose edium	Dense	Density Index 15 - 35% Density Index 35 - 65%					
GLB1		- De str	rata change	SUCI	HP	Hand	Penetro	meter test (UC	CS kPa)	,		D	D	ense	_ 0.100	Density Index 65 - 85%
с												۷U	· V6	ыy D€	-113C	Density illuex 00 - 100%

						INGI	NEE	RING	LOG -	Т			т	EST	PIT N	io: TP9	
F	RE	G	IONA	۱L		LIENT	:		Local Gove	ernment Er	ngineering Se	ervices		P	AGE	:	1 of 1
G	EOTEC	CHN	ICAL SOLUT	IÓNS	F	ROJE	CT NA	ME:	Proposed I	Highway In	tersection			J	OB I	NO:	RGS30969.1
17					5	SITE LO	CATI	ON:						L	OGG	GED B	SY: AH
					Т	EST L	OCAT	ION:	Refer to Fi	gure 1				D	ATE	:	3/8/16
E	QUII EST	PM PI	ENT TYP I LENGTI	E: H:	7.5T E 1.2 m	Excava W	tor /IDTH:	0.5	5 m		EASTING: NORTHING	:	5 [ACE M:	RL:	AHD
		Drillir	ng and Sar	npling				Ma	aterial descrip	otion and pro	file information				Fiel	d Test	
							NO						_	۲			
METHOD	MATED		SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATI SYMBOL	MAT	rerial desi	CRIPTION: S stics,colour,n	ioil type, plastici ninor componer	ty/particle hts	MOISTURE CONDITION	CONSISTENC DENSITY	Test Type	Result	Structure and additional observations
	toro	iele						0.02m 0.05m S	SPRAY SEAL FILL: Gravelly	.: 20mm / SAND, fine	to coarse graine	ed, grey,	L.	VD			PAVEMENT GRAVEL
		Cou							ravel is fine,	cement stabi	lized		> >	Н			Bound cement stabilised
	ů t	ŭ					×	fi	ine to mediun	n gravel, with	fine to medium	rown, with I sand	2			000	Possibly stabilised
	Z	z													HP	600	
								0.38m									
							CL	S	Silty CLAY: N	Andium plasti	city, orange bro	wn,	Š	VSt - н	HP	350	RESIDUAL
			0.50m		0.5			g	jravel				Ξ				
															HP	400	
			DB														
			0.75m														
								0.80m									
								F	-lole Terminat	ted at 0.80 m							
0						-											
Situ To					10												
and In					1.9	1											
el Lab																	
t Datg																	
30.004						-											
5:13 8																	
016 16						1											
09/08/2																	
(e>>																	
awingF					1.5	-											
ŠÖ V																	
-T.GPJ						1											
DKA																	
0969.																	
RGS3						1											
IId IS																	
E - TES						1											
				<u> </u>	Notes C	mele -						Consist	<u> </u>			Ce //-F	
	ater	ιD:			NOTES, Sa	unpies a		13				VS V	ery Soft		<u>0</u> <2	<u>сэ (кРа</u> 25	D Dry
L CORE	Z V	Vate	er Level		U₅₀ CBR	50mn Bulk s	n Diame sample f	ter tube s or CBR t	sample testing			S S	oft irm		25 50	5 - 50) - 100	M Moist W Wet
	(Date and time shown) E Environmental sample Water Inflow ASS Acid Sulfate Soil Sample							St St St St	tiff erv Stiff		10 20	0 - 200 0 - 400	W _p Plastic Limit				
og RG									ard		>2	100 100					
	trata	Cha Gra	nges adational or		Field Tes	<u>ts</u>						Fb F Density	riable V	Ve	ery Lo	ose	Density Index <15%
1.04.3.(Cradational strata PID Photoionisation detector reading (ppm) DCP(x-y) DVnamic penetrometer test (test depth interval shown)						own)		L MF	Lo M	oose ediun	n Dense	Density Index 15 - 35% Density Index 35 - 65%				
(G LIB		Definitive or distict strata change DCP(x-y) Dynamic penetrometer test (test depth interval shown)								,		D	D(ense erv Di	ense	Density Index 65 - 85% Density Index 85 - 100%	

				Ē	NGI	NEE	RING LOG - TEST PIT			Т	EST	PIT N	io: TP10
IF	EG	SIONA	۱L	/ c	LIENT	:	Local Government Engineer	ng Services		P	AGE		1 of 1
ĠE	DTECHI	NICAL SOLUT	IÒNS	P	ROJE		ME: Proposed Highway Intersect	on		J	ові	NO:	RGS30969.1
-				s	ITE LO	CATI	ON:			L	OGG	SED B	Y: AH
				т	EST L	OCAT	ION: Refer to Figure 1			D	ATE	:	3/8/16
EC			'E:	7.5T E	Excava	tor	EAST		;	SURF	ACE	RL:	
	31 P		п :	1.2 11	••	וטוה:				DATU			AND
		ling and Sar	npiing			7		nation			Field	a rest	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATIOI SYMBOL	MATERIAL DESCRIPTION: Soil type, characteristics,colour,minor cor	plasticity/particle nponents	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
ш	ered				****	×	0.02m SPRAY SEAL: 20mm		D	VD			WEARING SURFACE
	ount			-		*	Gravel is fine to medium grained	e grained, grey, /	M	VD			Heavily bound cement
	Not Enc			-		× × × × ×	FILL: Gravelly SAND, fine to coars brown, gravel is fine to medium gra	e grained, grey, ined					FILL SUBGRADE Possibly lime stabilised
				-		SP	0.28m Clavey SAND: fine to medium grain	ned. brown	м	D - VD			RESIDUAL
				-	///								
				0.5	/ /	-	0.50m						
					<u>/</u>	GP	Clayey GRAVEL: Fine to medium	grained, lark grev	М	VD			
				-	/	4							
					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~								
		0.75m		-			0.75m						
		0.1 0.11	1	_		CL	Silty CLAY: Medium plasticity, red	brown and pale	Š	Н			
							grey with fine to coarse ironstone g	avei	Σ				
-		DB		-									
situ Too		1.00m		1.0									
		1.00m		1.0		1	Hole Terminated at 1.00 m						
I Lab a				_									
Datge													
0.004				-	-								
13 8.3													
016 16:				-	-								
9/08/20													
\$ }													
vingFile				1. <u>5</u>	-								
< <drav< th=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></drav<>													
GPJ				-	1								
RAFT													
69.1 D				-	1								
GS30				-	-								
PIT R													
TEST				-	-								
- HOLE -													
	GEND:		<u> </u>	Notes, Sa	mples a	nd Tes	ts	Consiste			U	CS (kPa	Moisture Condition
	ter Wa	ter l evel		U ₅₀	50mm	n Diame	ter tube sample	s s	ery Soff oft	L	<2 25	5 - 50	M Moist
	(Da	te and time s	hown)	CBR E	Bulk s Enviro	sample f	for CBR testing al sample	F F St S	irm tiff		50 10	) - 100 )0 - 200	W Wet W _p Plastic Limit
KG K	- Wa	ter Inflow		ASS	Acid S	Sulfate S	Soil Sample	VSt V	ery Stiff	:	20	0 - 400	W _L Liquid Limit
⁶⁰ Str	Water Outflow B Bulk Sample Strata Changes					H F Fb F	ard riable		>2	iuu			
3.GLB	Gradational or PID Photoionisat				ts Photo	ionisati	on detector reading (ppm)	<u>Density</u>	V	Ve	ery Lo	oose	Density Index <15% Density Index 15 - 35%
8 1.04.	transitional strata PID Definitive or distict				Dynar	mic pen	etrometer test (test depth interval shown)		M	D M	ediun	n Dense	e Density Index 35 - 65%
RG LIE	st	trata change		ΗP	Hand	Penetro	ometer test (UCS kPa)		D VD	De De	ense ery De	ense	Density Index 65 - 85% Density Index 85 - 100%

# Appendix B

Laboratory Test results



E	AC TESTING SERVICES			AC Testing Se	ervices:/	Accreo oucca A	ditation Heads BN: 38 Ph:(	No. 19604 ,NSW 244 357852585 043885737
Client:	Regional Geotechnical Solutions	Report No.	ACTS-665					
Address:	1/21 Cook Drive,	Issue No.	1					
	Coffs Harbour, NSW, 2450	Date Sampled:	09.08.16	By:	AC			
Project:	RGS30969.1-LGES	Test Date:	12.08.16	Page:		2	of	2
Location:	Gwydir Highway Intersection, Glen Innes	Sample No:	ACTS16-08-005					
Material:	TP4, 0.05 - 0.25m							

# **MOISTURE CONTENT REPORT**

Test Method: RMS T120

Sampling Method: Submitted By client

Specification: N/A

LOCATION	DEPTH	MOISTURE CONTENT %
TP4	0.05 - 0.25m	7.7

 Comments:
 Approved Signatory:
 Mathick Mat



E	AC TESTING SERVICES			AC Testing Se	ervices:/	Accreo oucca A	ditation Heads BN: 38 Ph:(	No. 1960 NSW 244 357852585 043885737
Client:	Regional Geotechnical Solutions	Report No.	ACTS-666					
Address:	1/21 Cook Drive,	Issue No.	1					
	Coffs Harbour, NSW, 2450	Date Sampled:	09.08.16	By:	AC			
Project:	RGS30969.1-LGES	Test Date:	12.08.16	Page:		2	of	2
Location:	Gwydir Highway Intersection, Glen Innes	Sample No:	ACTS16-08-006					
Material:	TP7, 0.05 - 0.25m							

# **MOISTURE CONTENT REPORT**

Test Method: RMS T120

Sampling Method: Submitted By client

Specification: N/A

LOCATION	DEPTH	MOISTURE CONTENT %
TP7	0.05 - 0.25m	10.2

 Comments:
 Approved Signatory:
 Matheway

 Name:
 Adam Crawford

 Date of Issue
 23.08.16

 Accredited for compliance with ISO/IEC 17025.
 Report Form No. 2 05/10/2014

AC Testing Services: Accreditation No.19604 7 Hallidise St, Nambucca Heads, NSW 2448 AC TESTING SERVICES ABN: 38578525858 Ph:0438857377 Report No. ACTS-667 Client: **Regional Geotechnical Solutions** Address: 1/21 Cook Drive, Issue No. 1 Coffs Harbour, NSW, 2450 By: Client Date Sampled 09.08.16 Project: RGS30969.1-LGES Page: 2 Date Tested: 12.08.16 1 of Gwydir Highway Intersection Sample No ACTS16-08-007 **Glenn Innes** Location: CALIFORNIA BEARING RATIO REPORT Sample No. ACTS16-08-007 Location TP 5 0.3 - 0.5m LABORATORY COMPACTION LABORATORY REPORT t/m3 Maximum Dry Density 1.33 Optimum Moisture Content % 36.5 Material Retained 19.0 mm sieve % 0.0 % Compaction Specified 100.0 Compaction Achieved % 100.0 SPECIMEN DRY DENSITY At Compaction t/m3 1.32 ii After Soaking t/m3 1.35 **SPECIMEN MOISTURE CONTENT** % Field / Initial 34.7 % i At Compaction 36.6 % ii After Soaking 38.7 iii Top 30mm layer % 45.9 % iv Rest of Sample 38.7 **CBR TEST DETAILS** Soaking Period days 10 Swell % 2.1 Surcharge mass 4.5 kg CALIFORNIA BEARING RATIO % 5.0 **Test Methods Used** A,B,C,D,J Test Methods A. RMS T111 Dry Density/Moisture Relations of Road Materials (Standard Compaction). C. RMS T120 Determination of Moisture Content of Road Materials (Standard Method). D. RTA T117 Determination of the California Bearing Ratio of Remoulded Specimens of Road Materials (Standard Method). F. AS 1289 5 1.1 Dry Density/Moisture Relationship (Standard Compaction). H. AS 1289 2.1.1 Determination of Moisture Content (Standard Method). I. AS 1289 6.1.1 Determination of the California Bearing Ratio of A Soil -Standard Method For a Remoulded Specimens . J. 2.5 mm result reported, NO repeat test performed. Art K. Sampled according to AS 1141.3.1 NAT **Approved Signatory: Adam Crawford** 

Accredited for compliance with ISO/IEC 17025.

Date:

23.08.16

Report Form No.3

I)	AC TESTING SERVICES			AC Testing Se	ervices:/	Accreo oucca A	ditation Heads BN: 38 Ph:(	No. 19 NSW 2 3578525 0438857	604 2448 5858 7377
Client:	Regional Geotechnical Solutions	Report No.	ACTS-667						
Address:	1/21 Cook Drive,	Issue No.	1						
	Coffs Harbour, NSW, 2450	Date Sampled:	09.08.16	By:	AC				
Project:	RGS30969.1-LGES	Test Date:	12.08.16	Page:		2	of	2	
Location:	Gwydir Highway Intersection, Glen Innes	Sample No:	ACTS16-08-007						
Material:	TP5, 0.3 - 0.5m								

# **MOISTURE CONTENT REPORT**

Test Method: RMS T120

Sampling Method: Submitted By client

Specification: N/A

LOCATION	DEPTH	MOISTURE CONTENT %
TP5	0.3 - 0.5m	43.9

 Comments:
 Approved Signatory:
 Matheway

 Name:
 Adam Crawford

 Date of Issue
 23.08.16

 Accredited for compliance with ISO/IEC 17025.
 Report Form No. 2 05/10/2014

AC Testing Services: Accreditation No.19604 7 Hallidise St, Nambucca Heads, NSW 2448 AC TESTING SERVICES ABN: 38578525858 Ph:0438857377 Report No. ACTS-668 Client: **Regional Geotechnical Solutions** Address: 1/21 Cook Drive, Issue No. 1 Coffs Harbour, NSW, 2450 By: Client Date Sampled 09.08.16 Project: RGS30969.1-LGES Page: 2 Date Tested: 12.08.16 1 of Gwydir Highway Intersection Sample No ACTS16-08-008 **Glenn Innes** Location: CALIFORNIA BEARING RATIO REPORT Sample No. ACTS16-08-008 TP 2 Location 0.4 - 0.8m LABORATORY COMPACTION LABORATORY REPORT t/m3 Maximum Dry Density 1.43 Optimum Moisture Content % 31.4 Material Retained 19.0 mm sieve % 0.0 % Compaction Specified 100.0 Compaction Achieved % 100.0 SPECIMEN DRY DENSITY At Compaction t/m3 1.42 ii After Soaking t/m3 1.44 **SPECIMEN MOISTURE CONTENT** % Field / Initial 30.2 % i At Compaction 31.5 % ii After Soaking 36.4 iii Top 30mm layer % 45.1 % iv Rest of Sample 36.4 **CBR TEST DETAILS** Soaking Period days 10 Swell % 3.3 Surcharge mass 4.5 kg CALIFORNIA BEARING RATIO % 4.0 **Test Methods Used** A,B,C,D, J Test Methods A. RMS T111 Dry Density/Moisture Relations of Road Materials (Standard Compaction). C. RMS T120 Determination of Moisture Content of Road Materials (Standard Method). D. RTA T117 Determination of the California Bearing Ratio of Remoulded Specimens of Road Materials (Standard Method). F. AS 1289 5 1.1 Dry Density/Moisture Relationship (Standard Compaction). H. AS 1289 2.1.1 Determination of Moisture Content (Standard Method). I. AS 1289 6.1.1 Determination of the California Bearing Ratio of A Soil -Standard Method For a Remoulded Specimens . J. 2.5 mm result reported, NO repeat test performed. Art K. Sampled according to AS 1141.3.1 NAT

Accredited for compliance with ISO/IEC 17025.

Approved Signatory: Adam Crawford

Date:

23.08.16

Report Form No.3

I)	AC TESTING SERVICES			AC Testing Se	ervices:/ St, Namł	Accreo oucca A	ditation Heads BN: 38 Ph:(	No. 19 NSW 2 3578525 0438857	504 2448 5858 7377
Client:	Regional Geotechnical Solutions	Report No.	ACTS-668						
Address:	1/21 Cook Drive,	Issue No.	1						
	Coffs Harbour, NSW, 2450	Date Sampled:	09.08.16	By:	AC				
Project:	RGS30969.1-LGES	Test Date:	12.08.16	Page:		2	of	2	
Location:	Gwydir Highway Intersection, Glen Innes	Sample No:	ACTS16-08-008						
Material:	TP2, 0.4 - 0.8m								

# **MOISTURE CONTENT REPORT**

Test Method: RMS T120

Sampling Method: Submitted By client

Specification: N/A

LOCATION	DEPTH	MOISTURE CONTENT %
TP2	0.4 - 0.8m	39.2

 Comments:
 Approved Signatory:
 Matheway

 Name:
 Adam Crawford

 Date of Issue
 23.08.16

 Accredited for compliance with ISO/IEC 17025.
 Report Form No. 2 05/10/2014

AC Testing Services: Accreditation No.19604 7 Hallidise St, Nambucca Heads, NSW 2448 AC TESTING SERVICES ABN: 38578525858 Ph:0438857377 Report No. ACTS-669 Client: **Regional Geotechnical Solutions** Address: 1/21 Cook Drive, Issue No. 1 Coffs Harbour, NSW, 2450 By: Client Date Sampled 09.08.16 Project: RGS30969.1-LGES Page: 2 Date Tested: 12.08.16 1 of Gwydir Highway Intersection Sample No ACTS16-08-009 **Glenn Innes** Location: CALIFORNIA BEARING RATIO REPORT Sample No. ACTS16-08-009 TP 3 Location 0.5 - 0.75m LABORATORY COMPACTION LABORATORY REPORT t/m3 1.74 Maximum Dry Density Optimum Moisture Content % 19.8 Material Retained 19.0 mm sieve % 0.0 % Compaction Specified 100.0 Compaction Achieved % 101.0 SPECIMEN DRY DENSITY At Compaction t/m3 1.73 ii After Soaking t/m3 1.75 **SPECIMEN MOISTURE CONTENT** % Field / Initial 18.4 % i At Compaction 20.0 % 20.7 ii After Soaking iii Top 30mm layer % 21.4 % iv Rest of Sample 20.7 **CBR TEST DETAILS** Soaking Period days 10 Swell % 0.0 Surcharge mass 4.5 kg CALIFORNIA BEARING RATIO % 25.0 **Test Methods Used** A,B,C,D, J Test Methods A. RMS T111 Dry Density/Moisture Relations of Road Materials (Standard Compaction). C. RMS T120 Determination of Moisture Content of Road Materials (Standard Method). D. RTA T117 Determination of the California Bearing Ratio of Remoulded Specimens of Road Materials (Standard Method). F. AS 1289 5 1.1 Dry Density/Moisture Relationship (Standard Compaction). H. AS 1289 2.1.1 Determination of Moisture Content (Standard Method). I. AS 1289 6.1.1 Determination of the California Bearing Ratio of A Soil -Standard Method For a Remoulded Specimens . J. 5.0mm result reported, NO repeat test performed. Art K. Sampled according to AS 1141.3.1 NAT **Approved Signatory: Adam Crawford** 

Accredited for compliance with ISO/IEC 17025.

Date:

23.08.16

Report Form No.3

E D	AC TESTING SERVICES			AC Testing Se	ervices:/	Accreo bucca A	ditation Heads BN: 38 Ph:(	No. 1960 ,NSW 24 35785258 04388573	)4 48 58 77
Client:	Regional Geotechnical Solutions	Report No.	ACTS-669						Γ
Address:	1/21 Cook Drive,	Issue No.	1						
	Coffs Harbour, NSW, 2450	Date Sampled:	09.08.16	By:	AC				
Project:	RGS30969.1-LGES	Test Date:	12.08.16	Page:		2	of	2	
Location:	Gwydir Highway Intersection, Glen Innes	Sample No:	ACTS16-08-009						
Material:	TP3, 0.5 - 0.75mm								

# **MOISTURE CONTENT REPORT**

Test Method: RMS T120

Sampling Method: Submitted By client

Specification: N/A

LOCATION	DEPTH	MOISTURE CONTENT %			
TP3	0.5 - 0.75m	28.6			

 Comments:
 Approved Signatory:
 Matheway

 Image: Adam Crawford
 Date of Issue
 23.08.16

 Accredited for compliance with ISO/IEC 17025.
 Report Form No. 2 05/10/2014

AC Testing Services: Accreditation No.19604 7 Hallidise St, Nambucca Heads, NSW 2448 AC TESTING SERVICES ABN: 38578525858 Ph:0438857377 Report No. ACTS-670 Client: **Regional Geotechnical Solutions** Address: 1/21 Cook Drive, Issue No. 1 Coffs Harbour, NSW, 2450 By: Client Date Sampled 09.08.16 Project: RGS30969.1-LGES Page: 2 Date Tested: 12.08.16 1 of Gwydir Highway Intersection Sample No ACTS16-08-0010 **Glenn Innes** Location: CALIFORNIA BEARING RATIO REPORT Sample No. ACTS16-08-010 TP 7 Location 0.6 - 0.75m LABORATORY COMPACTION LABORATORY REPORT t/m3 Maximum Dry Density 1.21 Optimum Moisture Content % 44.1 Material Retained 19.0 mm sieve % 0.0 % Compaction Specified 100.0 Compaction Achieved % 100.0 SPECIMEN DRY DENSITY At Compaction t/m3 1.21 ii After Soaking t/m3 1.21 **SPECIMEN MOISTURE CONTENT** % Field / Initial 41.2 % 44.1 i At Compaction % 46.5 ii After Soaking iii Top 30mm layer % 49.7 % iv Rest of Sample 46.5 **CBR TEST DETAILS** Soaking Period days 10 Swell % 0.5 Surcharge mass 4.5 kg CALIFORNIA BEARING RATIO % 16.0 **Test Methods Used** A,B,C,D, J Test Methods A. RMS T111 Dry Density/Moisture Relations of Road Materials (Standard Compaction). C. RMS T120 Determination of Moisture Content of Road Materials (Standard Method). D. RTA T117 Determination of the California Bearing Ratio of Remoulded Specimens of Road Materials (Standard Method). F. AS 1289 5 1.1 Dry Density/Moisture Relationship (Standard Compaction). H. AS 1289 2.1.1 Determination of Moisture Content (Standard Method). I. AS 1289 6.1.1 Determination of the California Bearing Ratio of A Soil -Standard Method For a Remoulded Specimens . J. 2.5mm result reported, NO repeat test performed. Art K. Sampled according to AS 1141.3.1 NAT **Approved Signatory: Adam Crawford** Date: 23.08.16 Accredited for compliance with ISO/IEC 17025.

Report Form No.3

IN IN	AC TESTING SERVICES			AC Testing Se	ervices:/	Accreo oucca A	ditation Heads BN: 38 Ph:(	No. 1960 ,NSW 24 35785258 04388573	14 48 58 77
Client:	Regional Geotechnical Solutions	Report No.	ACTS-670						
Address:	1/21 Cook Drive,	Issue No.	1						
	Coffs Harbour, NSW, 2450	Date Sampled:	09.08.16	By:	AC				
Project:	RGS30969.1-LGES	Test Date:	12.08.16	Page:		2	of	2	
Location:	Gwydir Highway Intersection, Glen Innes	Sample No:	ACTS16-08-010						
Material:	TP7, 0.6 - 0.75mm								

# **MOISTURE CONTENT REPORT**

Test Method: RMS T120

Sampling Method: Submitted By client

Specification: N/A

LOCATION	DEPTH	MOISTURE CONTENT %			
TP7	0.6 - 0.75m	43.0			

 Comments:
 Approved Signatory:
 Mathick Mat

AC Testing Services: Accreditation No.19604 7 Hallidise St, Nambucca Heads, NSW 2448

						7 Hallidise S	t, Namt	oucca	Heads, NSW 2448
(H)	ACTESTING SERV	VICEZ.					AE	3N: 38	8578525858 Ph:0438857377
Client:	Regional Geotechn	ical Solu	itions	Report No. A	CTS-704				
Address:	1/21 Cook Drive,			Issue No. 1					
	Coffs Harbour, NS	N, 2450		Date Sampled 09	9.08.16	By: Client	t		
Project:	RGS30969.1-LGES	S		Date Tested: 08	3.09.16	Page:	1	of	1
Location:	Gwydir Highway Int Glenn Innes	ersectio	n	Sample No A	CIS16-09-0	49			
	C	ALIFO	RNIA BEA	RING RAT	IO REF	PORT			
Comple No			A OT 040 00 040		-				
Sample No.			AC1S16-09-049						
Location			1P 10						
			0.75 - 1.0m						
LABORATO						<u> </u>			
Maximum Dr	ry Density	t/m3	1.52						
Optimum Mc	pisture Content	%	27.9						
Material Reta	ained 19.0 mm sieve	%	0.0						
Compaction	Specified	%	100.0						
Compaction	Achieved	%	101.2						
			SPECIME	EN DRY DENS	ITY				
i At Compact	tion	t/m3	1.52						
ii After Soaki	ing	t/m3	1.51						
			SPECIMEN N	IOISTURE CO	NTENT				
Field / Initia	al	%	28.8						
i At Compact	tion	%	27.9						
ii After Soaki	ing	%	31.2						
iii Top 30mm	n layer	%	33.4						
iv Rest of Sa	ample	%	31.2						
			CBR 1	<b>TEST DETAILS</b>	6				
Soaking Peri	iod	days	10						
Swell		%	0.9						
Surcharge m	nass	kg	4.5						
CALIFORI	NIA BEARING RAT	'IO %	13.0						
Test Method	ds Used		A,B,C,D, J						
Test Methods									
A. RMS T111 D	Pry Density/Moisture Relations	s of Road I	Materials (Standard	Compaction).					
C. RMS T120 D	Determination of Moisture Cor	ntent of Ro	ad Materials (Stand	ard Method).					
D. RTA T117 D	etermination of the California	Bearing R	atio of Remoulded	Specimens of Roa	d Materials (S	Standard Method	).		
F. AS 1289 5 1.	1 Dry Density/Moisture Relat	ionship (Si	tandard Compaction	1).					
11. AS 1209 2.1.	1 Determination of the Califor	nia Rearie	n Ratio of A Soil St	andard Method Ea	r a Remoulde	d Specimens			
.1 2 5mm result	reported NO repeat test per	formed				eu opecimens .			
K. Sampled acc	cording to AS 1141.3.1					٨		/	
	J					<u>A</u>	$\nearrow$	÷	



Accredited for compliance with ISO/IEC 17025.

Approved Signatory: Adam Crawford

Date:

19.09.16

Report Form No.3

AC Testing Services: Accreditation No.19604 7 Hallidise St, Nambucca Heads, NSW 2448

E	AC TESTING SERV	ICES.				7 Hallidise St	, Nambucca ABN: 3	a Heads, NSW 2448 38578525858 Ph:0438857377
Client:	Regional Geotechni	cal Solu	itions	Report No. AC	CTS-705			
Address:	1/21 Cook Drive,			Issue No. 1				
Draiget	Coffs Harbour, NSV	√, 2450		Date Sampled 09	0.08.16	By: Client	1 of	4
Project.	Gwydir Highway Inte	ersectio	n	Sample No AC	0.09.10 CTS16-09-050	Page.	I OI	I
Location:	Glenn Innes	100010		Campie No Ac				
	CA	LIFO	RNIA BEA	RING RAT		DRT		
Sample No.			ACTS16-09-050					
Location			TP 9					
			0.5 - 0.75m					
LABORATO	RY COMPACTION		1	LABORATOR	Y REPORT			
Maximum Dr	ry Density	t/m3	1.58					
Optimum Mo	pisture Content	%	26.3					
Material Reta	ained 19.0 mm sieve	%	0.0					
Compaction	Specified	%	100.0					
Compaction	Achieved	%	100.1					
			SPECIME					
i At Compact	tion	t/m3	1.58					
ii After Soaki	ing	t/m3	1.59					
	0		SPECIMEN N	OISTURE COI	NTENT			
Field / Initia	I	%	31.4					
i At Compact	tion	%	26.0		1			
ii After Soaki	ing	%	29.9	1				
iii Top 30mm	n layer	%	33.1					
iv Rest of Sa	imple	%	29.9					
			CBR 1	LEST DETAILS	5	•		•
Soaking Peri	iod	days	10					
Swell		%	1.6					
Surcharge m	ass	kg	4.5					
CALIFORI	NIA BEARING RAT	0 %	6.0					
Test Method	ds Used		A,B,C,D, J		1			
Test Methods			1		1			
A. RMS T111 D	ry Density/Moisture Relations	of Road I	Materials (Standard	Compaction).				
C. RMS T120 D	etermination of Moisture Cont	ent of Ro	ad Materials (Standa	ard Method).				
D. RTA T117 De	etermination of the California	Bearing R	atio of Remoulded S	Specimens of Road	d Materials (Star	ndard Method)		
F. AS 1289 5 1.	1 Dry Density/Moisture Relation	onship (St	tandard Compaction	າ).				
H. AS 1289 2.1.	.1 Determination of Moisture (	Content (S	standard Method).					
I. AS 1289 6.1.1	1 Determination of the Californ	ia Bearing	g Ratio of A Soil -Sta	andard Method For	r a Remoulded S	Specimens .		
J. 2.5mm result	reported, NO repeat test pert	ormed.						/
K. Sampled acc	cording to AS 1141.3.1					A	r t	
		NAT	A			12		
				Αμ	oproved Sig	natory: Ada	am Craw	ford

Accredited for compliance with ISO/IEC 17025.

Date:

19.09.16

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# Appendix C

**Pavement Thickness Designs** 

# FLEXIBLE PAVEMENT THICKNESS DESIGN

CLIENT:

Local Government Engineering Services

PROJECT: Proposed Gwydir Highway Intersection and Turning Lane Upgrdae

LOCATION: Gwydir Highway West of Glen Innes

				Date:	14/12/2016						
ROAD NAME:	Gwydir Highway		Refer to drawing:		Figure 1						
Chainage Interval (m):	N/A		Road classification ref:		HW12						
Road Classification:	Highway (HW)		Design Traffic:		$4.4 \times 10^{6}$						
		Subgr	ade Conditions								
Expected subgrade:	Natural residual clay, medium plasti	city, very stiff	and existing pavement profile								
Adopted Subgrade CBR value:	4%		Required subgrade compaction:		100% Standard Compaction						
Potential construction or performance issues:	Variable subgrade conditions compr benched to tie in with existing road replacnment of soft spots.	ising natural r and pavement	esidual clay and existing highway paver formation profile. Some localised sec	nent profile. Ro tions could requ	ad widening will need to be approapriately ire specific treament such as removal and						
		Pave	ement Design								
Recommended Pavement Layer	Thickness:	Recom	mended Material requirements		Required Compaction						
Wearing course thickness (mm):	Two Coat Seal or 30mm AC	14/7 spray seal		14/7 spray seal		14/7 spray seal		14/7 spray seal			As per Suppliers specification
Base thickness (mm):	150	RMS specifi	cation 3051 DGB20 compliant material		98% Modified Compaction						
Sub-base thickness (mm):	370	RMS specifi	cation 3051 DGB20 compliant material		97% Modified Compaction						
Select thickness (mm)	as required	To RMS spec	ification 3071, placed to RMS spec R44		100% Standard Copmpation						
Total thickness (mm):	520										
		D	efinitions:								
Design traffic loading:	The anticipated number of equivalent standa	rd axles (ESA), as	defined by AUSTROADS, in the design lane during	g the design life of th	ne pavement.						
Modified Compaction:	Minimum required dry density ratio (AS1289 using AS1289 5.2.1-2003 or equivalent.	5.4.1-2007) defin	ed as the ratio of the calculated field dry density	(AS1289 5.3.1-2004	or equivalent) to the maximum dry density obtained						
Standard Compaction:	Minimum required dry density ratio (AS1289 using AS1289 5.1.1-2003 or equivalent.	5.4.1-2007) defin	ed as the ratio of the calculated field dry density	(AS1289 5.3.1-2004	or equivalent) to the maximum dry density obtained						
Density Index:	Minimum required Density Index AS1289 5.6. minimum density obtained by AS1289 5.5.1-1	1-1998, defined a 998 or equivalen	is the ratio of field dry density determined by AS: t	1289 5.3.1-2004 or e	equivalent to the laboratory values of maximum and						
Note: Pavement design recommendation	assume appropriate drainage is instal s regarding drainage, pavement const	led and maint ruction and pa	ained. Refer to Regional Geotechnical avement tie in requiremenst.	Solutions Repor	t No. RGS30969.1-AB Rev.1 for						

Job No.:

RGS30969.1

