12/18

Bajool - Port Alma Road Proposed Pavement Design

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DOCUMENT CONTROL

The following provides the record of authorisation and revisions made to this document.

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0	13/09/2018	Draft Issue	NR	NR	NR
1	09/11/2018	Final Issue	NR	NR	NR
2	12/12/2018	Final Issue	NR	NR	NR

This report has been prepared for the benefit of the Stantec with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

DYKMAN Consulting Pty Ltd

Certified by:

NR

NR

Director (RPEQ 7189)

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1 INTRODUCTION

1.1 Scope

DYKMAN Consulting (DC) has been commissioned by Stantec to produce pavement design solutions for the re-alignment of the reverse curves situated between chainages 12400 and 13000. To support the design the geotechnical site investigations undertaken by Main Roads was used in the design development. The proposed re-alignment is approximately 600m in length. As part of this report a like for like pavement design has been included where trenches are situated.

A summary of the geotechnical site investigations can be seen in Section 2.

This report presents the findings of the geotechnical investigation and provides pavement options for the re-alignment as well as like for like pavement options for the trench areas.

1.2 Locality

The scope involves a pavement investigation for the re-alignment of approximately 600m of Bajool-Port Alma Road as well as providing a like for like pavement profiles for areas where localised widening is occurring resulting from the trenches. A locality of the job site can be seen in Figure 1-1.

Figure 1-1 Bajool -Port Alma Road Locality

2 GEOTECHNICAL INVESTIGATIONS

2.1 Field Work Testing Results

The field work was carried out by Main Roads at various times, 2008, 2016 and 2018 over the length of the road.

A summary of the pavement boreholes undertaken on Bajool – Port Alma Road can be seen in Figure 2-1to 2.3.

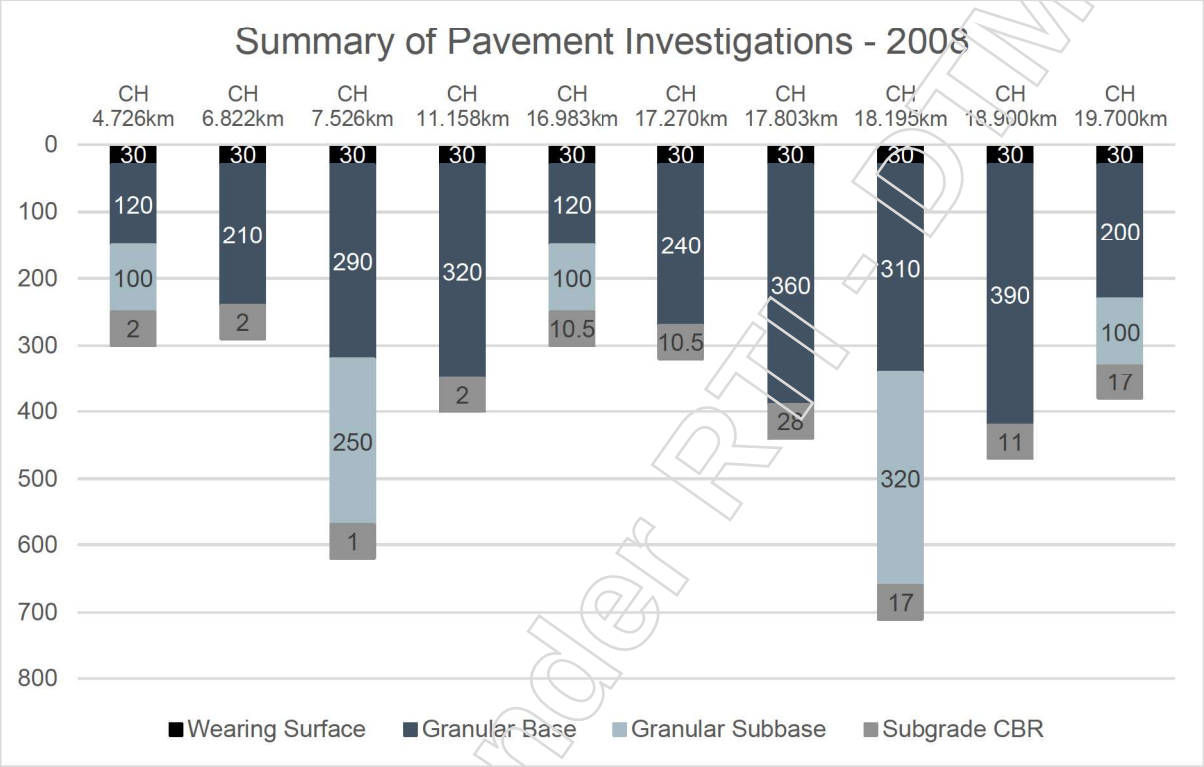

Figure 2-1 Geotechnical Summary of the fieldwork results

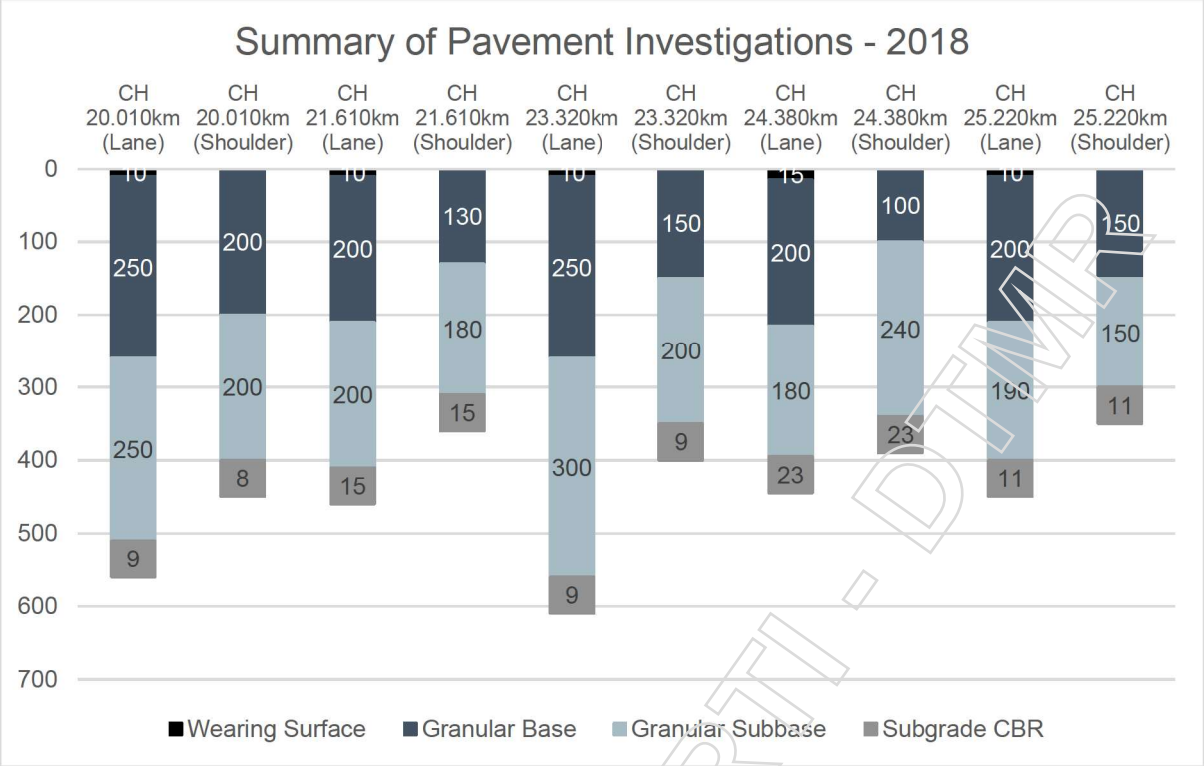

Figure 2-2 Geotechnical Summary of the fieldwork results

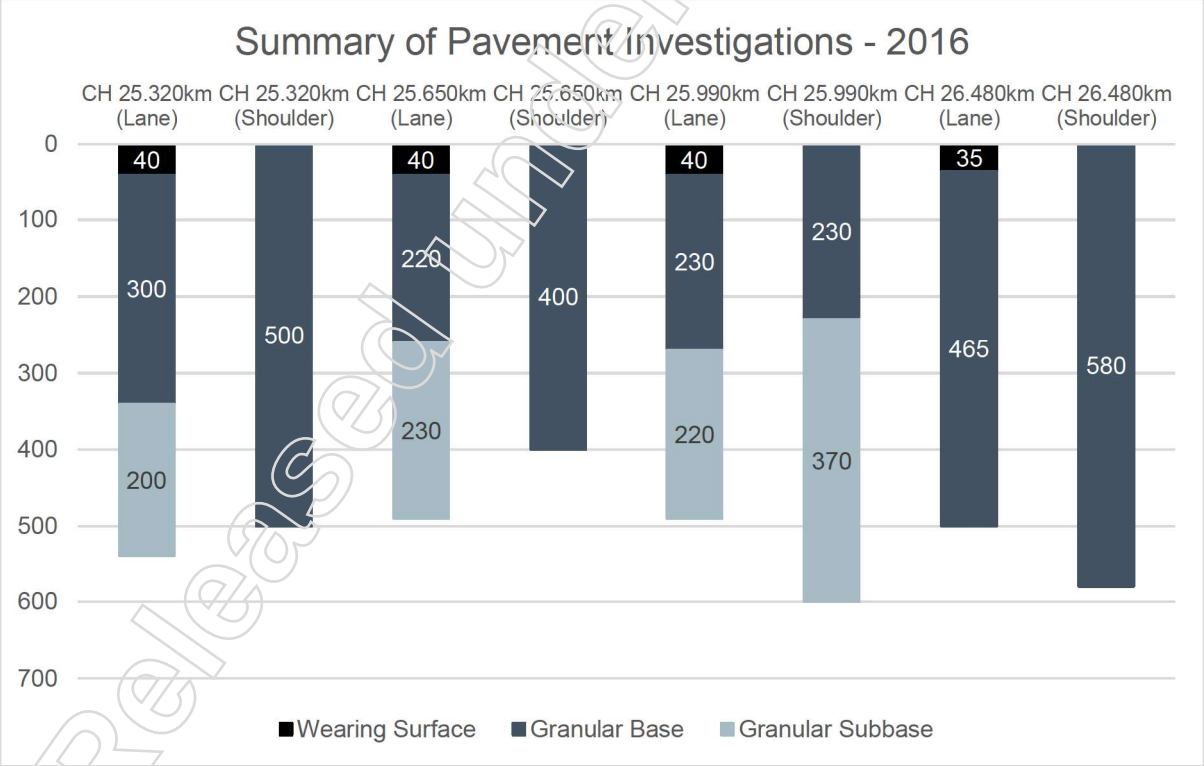

Figure 2-3 Geotechnical Summary of the fieldwork results

In summary, the existing pavement and shoulders contain good depths of varying quality of granular material. Generally, the shoulders have slightly less granular material.

3 BASIS OF DESIGN

3.1 Reference Documents

The reference documents that have been used in the determination of the pavement design are as follows:

- Queensland Department of Transport and Main Roads – Supplement to 'Part 2: Pavement Structural Design' of the Austroads Guide to Pavement Technology 2018;
- Austroads – Guide to Pavement Technology: Part 2; and
- Queensland Department of Transport and Main Roads – Technical Standard MRTS10 - Cement Modified Base (CMB)
- Queensland Department of Transport and Main Roads – Technical Note 150 – Testing of Materials for Foamed Bitumen Stabilisation

3.2 Design Criteria

The design criteria applied to the pavement design options covered in this report are outlined in the following sections.

3.2.1 Design Period

The Design period that has been adopted for the realignment is 20 years which is in accordance with Table 7.4.2 in TMR's Pavement Design Supplement. In addition to this a 5-year design was also completed due to budget restraints.

3.2.2 Project Reliability

The Project Reliability that has been adopted for this project is 90% which is in accordance with Table 2.3.1 in TMR's Pavement Design Supplement.

3.2.3 Design Speed Environment

As the posted speed of the road is 80km/hr, the Design Speed that has been adopted for this project is 80km/hr, which is in accordance with Table 6.5.7 (b) in TMR's Pavement Design Supplement.

4 DESIGN DOCUMENTATION

4.1 Design Input Parameters

For pavement design purposes the project has been divided into two sections. The sectioning is as follows:

- Section 1: CH 12400 to CH 13000 – Realignment section
- Section 2: CH 0 to 29000 – Remaining road outside of the realignment section

4.1.1 Design Traffic

The traffic data that was used in the calculation of the design loading was as follows:

- AADT (2017) – 259 both directions
- Traffic growth – 3.0%
- Percentage of Heavy Vehicles – 38.2%

The data supplied by Stantec can be seen in Appendix A, with highlighted sections to show how the input data was adopted.

The traffic multipliers that were adopted were from Austroads Guide to Pavement Technology Part 2, they are as follows:

- SAR5/ESA – 1.1
- SAR7/ESA – 1.6
- SAR12/ESA – 12

Design Traffic Loading (DTL) are in terms of Equivalent Standard Axles (ESA). The design traffic calculated using the above input data was for a 20 year design period is 8.5E05 and for a 5 year period is 1.68 E05. The traffic calculations can be seen in Appendix A.

4.1.2 Subgrade Assessment

For the purpose of providing design subgrade CBR's, reference is made to a summary of the geotechnical information contained in Section 2. The adopted CBR for the realignment section is CBR 2% with a swell 3.7%. Taking this swell into account this equates to a depth of pavement of approximately 680mm in accordance with Figure 5.3.5 of TMR's Pavement Design Supplement.

4.1.3 Material Characteristics

In determining the pavement options and design, the material characteristics that have been adopted can be seen in Table 4-1.

Table 4-1 Material characteristics

Material	Relevant Specification	Asphalt Binder	Design Modulus	Poisson's ratio	Fatigue Constant
FBS Base	TMR TN150	7%	1800	0.4	0.004585
Cement Modified Base	MRTS10	n/a	350	0.35	n/a
Unbound Granular Material	MRTS05	n/a	350	0.35	n/a
Unbound Granular Material	MRTS05	n/a	210	0.35	n/a

Material	Relevant Specification	Asphalt Binder	Design Modulus	Poisson's ratio	Fatigue Constant
Unbound Granular Material	MRTS05	n/a	150	0.35	n/a
Unbound Granular Material	MRTS05	n/a	120	0.35	n/a
Unbound Granular Material	MRTS05	n/a	70	0.35	n/a
Select Fill	MRTS05	n/a	70	0.45	n/a
CBR 3.0%	MRTS04	n/a	50	0.45	n/a

4.2 Pavement Options

As stipulated in the brief, all the pavement widenings associated with the trench excavation is proposed on a like for like basis with no strength determined. As can be seen from the summary of the geotechnical in Section 2 the shoulders are not the same thickness as the running lanes and vary by approximately 100mm.

The options presented below are for the realignment section.

The pavement options that have been considered are as following:

- Unbound granular with 10mm seal;
- Cement modified base with 10mm seal; and
- Plant mixed foamed bitumen stabilisation (FBS) with 10mm seal.

These options are in accordance with Table 2.2.1 of TMR's Pavement Design Supplement for a rural environment with the Average Daily ESA in Design Lane in Year of Opening of <100.

4.2.1 Option 1 – Unbound granular

The pavement configuration for the unbound granular option can be seen in Table 4-2.

Table 4-2 Pavement profiles for Option 1 – Unbound granular

Material	Thickness
Wearing Course Seal	10mm
Granular Material Type 2.1	150mm
Granular Material Type 2.3	150mm
Granular Material Type 2.5	230mm
Select Fill CBR10 Material (Capping Layer)	150mm
Total Pavement Thickness	680mm

The benefits of this pavement are:

- Initial capital costs are low;
- Matches existing pavement configuration; and
- Ease of construction and hence minimal delays.

The potential disadvantages are:

- Sensitive to moisture ingress; and
- Sourcing of quality granular material.

4.2.2 Option 2 – Cement modified base

The pavement configuration for the cement modified base option can be seen from Table 4-3.

Table 4-3 Pavement profiles for Option 2 – Cement modified base

Material	Thickness
Wearing Course Seal	10mm
Cement Modified Base	200mm
Granular Material Type 2.4	335mm
Select Fill CBR10 Material (Capping Layer)	150mm
Total Pavement Thickness	685mm

The benefits of this pavement are:

- Less sensitive to moisture ingress; and
- Proven results in this type of environment.

The potential disadvantages are:

- Could take longer to construct;
- Potential reflective cracking if additional cement is applied in the mix; and
- Slightly more expensive than granular.

4.2.3 Option 3 – Plant mixed FBS

The pavement configuration for the plant mixed FBS option can be seen from Table 4-4.

Table 4-4 Pavement profiles for Option 3 – Plant mixed FBS

Material	Thickness
Wearing Course Seal	10mm
Foamed Bitumen Stabilisation	300mm
Granular Material Type 2.5	155mm
Select Fill CBR10 Material (Capping Layer)	225mm
Total Pavement Thickness	680mm

The benefits of this pavement are:

- Proven treatment in flood affected areas; and
- This pavement was adopted on flood affected areas in Far North Queensland.

The potential disadvantages are:

- Potential issues with the construction of the FBS layer if contractor doesn't have experience with the material;
- Small project for specialist stabilisation treatment; and
- More expensive than other treatments.

4.2.4 Cost comparison

A rough cost estimate was undertaken to compare the different options for this project. The comparison of each treatment can be seen in Table 4-5.

Table 4-5 Cost comparison for pavement options

Materials	Cost	Option 1 – Unbound Granular		Option 2 – CMB		Option 3 – FBS	
		Depth	Cost/m2	Depth	Cost/m2	Depth	Cost/m2
Seal	$9.00 m2	y	$ 9.00	y	$9.00	y	$9.00
FBS	$120.0 tonne					300 mm	$88.20
CMB 1.5%	$110.00 m3			200 mm	$22.00		
Unbound Granular Material	$95.00 m3	530 mm	$50.35	335 mm	$31.83	155 mm	$14.73
Capping Layer	$20.00 m3	150 mm	$3.00	150 mm	$3.00	225 mm	$4.50
Total Depth & Cost		**680 mm**	**$62.35**	**685 mm**	**$65.83**	**680 mm**	**$116.43**

Note:

- The unit rates that were used were adopted from recent projects undertaken as well as historical data.

5 RECOMMENDED PAVEMENT DESIGN

The recommended pavement design for a 20-year and 5-year design period for the proposed realignment between Chainages 12400 and 13000 is full depth granular pavements with an 10mm seal as shown below in Table 5-1 and Table 5-2 respectively. This option is chosen as it will provide a consistent pavement configuration and match the existing pavements found in the remaining sections of Bajool -Port Alma Road. Foamed bitumen is more effective in flood prone areas but may cause construction difficulties with mobile plants and small volumes to construct.

This option was selected as the preferred option due to the following reasons:

- Cheapest option; and
- Consistent configuration to the rest of Bajool -Port Alma Road.

From the analysis below there is very little difference between 5-year design period and a 20-year design period for granular pavements, only 55mm for the realigned section. The designs below in Table 5-1 and Table 5-2 both satisfy the swells requirements.

For the remaining sections of Bajool -Alma Road a consistent 5-year design loading has been adopted for all sections which also matches relatively well as a like for like pavement. This has been based off a subgrade CBR 3% with no swell which is fairly conservative from the geotechnical investigations undertaken. It is unlikely that lower values than a CBR 3% will be encountered.

A prime and two coat seal (14/7mm) is recommended as a result of the salt conditions. Salt tends to strip the bitumen and hence a heavy application is required. The contractor should take this into account when designing the seal.

The recommended pavement design for the Proposed Realignment of a section of Bajool – Port Alma Road can be seen in Table 5-2.

Table 5-1 Recommended Pavement Design Section 1 Realigned Section – Full Depth Granular -20-year

Material	Thickness
Prime and 14/7mm Two Coat Seal	10mm
Granular Material Type 2.1	150mm
Granular Material Type 2.3	150mm
Granular Material Type 2.5	230mm
Select Fill CBR10 Material (Capping Layer)	150mm
Total Pavement Thickness	680mm

Table 5-2 Recommended Pavement Design Section 1 Realigned Section – Full Depth Granular -5-year

Material	Thickness
Prime and 14/7mm Two Coat Seal	10mm
Granular Material Type 2.1	150mm
Granular Material Type 2.3	150mm
Granular Material Type 2.5	175mm
Select Fill CBR10 Material (Capping Layer)	150mm
Total Pavement Thickness	625mm

The pavements shown below are 5-year designs and match the like for like pavements for the remaining section of Bajool – Port Alma Road. The existing pavement profiles can be seen in Section 2.

Table 5-3 Recommended Pavement Design Section 2 – Granular Material -Chainage 4.72 to Chainage 19.7

Material	Thickness
Prime and 14/7mm Two Coat Seal	10mm
Granular Material Type 2.1	200mm
Granular Material Type 2.3	265mm
Select Fill CBR 10 (Capping Layer) *	150mm
Total Pavement Thickness	465mm (or 615mm*)

Table 5-4 Recommended Pavement Design Section 2 – Granular Material -Chainage 20.1 to Chainage 25.2

Material	Thickness
Prime and 14/7mm Two Coat Seal	10mm
Granular Material Type 2.1	200mm
Granular Material Type 2.3	265mm
Select Fill CBR 10 (Capping Layer) *	150mm
Total Pavement Thickness	465mm (or 615mm*)

Table 5-5 Recommended Pavement Design Section 2 – Granular Material -Chainage 25.3 to End

Material	Thickness
Prime and 14/7mm Two Coat Seal	10mm
Granular Material Type 2.1	200mm
Granular Material Type 2.3	265mm
Select Fill CBR 10 (Capping Layer) *	150mm
Total Pavement Thickness	465mm (or 615mm*)

Notes:

* - Select Fill (CBR 10 min.) capping layer required where pavement depth extends into existing marine clay.

APPENDIX A

Traffic

APPENDIX B

CIRCLY

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BAJOOL - PORT ALMA ROAD
DESIGN DEVELOPMENT
GEOTECHNICAL REPORT

PREPARED FOR DEPARTMENT OF TRANSPORT AND MAIN ROADS

July 2018

Stantec

QUALITY STATEMENT

PROJECT MANAGER	NR		
PROJECT TECHNICAL LEAD	NR		
PREPARED BY	NR	.....	...../...../.....
CHECKED BY	NR	.....	...../...../.....
REVIEWED BY	NR	.....	...../...../.....
APPROVED FOR ISSUE BY	NR	.....	...../...../.....

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REVISION SCHEDULE

Rev No.	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
A	07/18	Draft for TMR review	NR	NR	NR	

Geotechnical Report

Options Analysis	Business Case	Preliminary Design	Detailed Design	Scheme Prototype

Bajool – Port Alma Road – Design Development **Road infrastructure**			
District / Region	Fitzroy	Local government	Rockhampton Regional Council
Road name	Bajool – Port Alma Road		
Location	Bajool, QLD, 4699		
Project number	TBC		
Project / DMS No	TBC		
Program	-		
Work description	Widening and Safety Improvements		
Document control sheet – contact for enquiries and proposed changes			
If you have any questions regarding this document or if you have a suggestion for improvements, please contact:			
Project Manager	NR		
Phone number	(07) 4931 1614		

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Appendix A PORT ALMA ROAD – PAVEMENT AND SUBGRADE INVESTIGATION REPORT, REPORT NO. 08/08 (ISSUED IN APRIL 2008)

Appendix B INVESTIGATION HOLE LOGS & INSITU CBR, PORT ALMA ROAD MAINTENANCE IMPROVEMENT REPORT, REPORT NO. 42542 (ISSUED IN FEBRUARY 2016)

Appendix C BAJOOL – PORT ALMA ROAD CH.19.7KM – 25.3KM PAVEMENT INVESTIGATION REPORT, REPORT NO. 07/18 (ISSUED IN JULY 2018)

Appendix D ACID SULFATE SOILS, BAJOOL – PORT ALMA AREA (ISSUED IN 2007)

1. Introduction

Bajool – Port Alma Road (BPAR) is located 36 kilometres south of Rockhampton, linking the Bruce Highway at the eastern extent (Chainage 0.0km) to the Port Alma facility at the western extent (Chainage 26.5km). The road forms part of the Queensland Key Freight Routes, connecting the Port to developments in the Bowen and Galilee Basins and servicing adjacent solar salt farms. The road is a HAZMAT Class 1 explosive freight and ammonium nitrate route, with the Port the highest volume licensed explosives port in Australia. Local businesses that utilise this road link have raised concerns / issues with respect of the existing road and its safety. Therefore, the road is required an upgrade that includes widening the pavement area and relocating existing power poles to underground services.

Stantec was engaged by the Department of Transport and Main Roads (DTMR) in July 2018 to undertake a detailed design (design development) for the Bajool – Port Alma Road Upgrade. As a part of the detailed design, geotechnical assessment has been undertaken. The assessment includes a review the available site investigation data; identifying potential geotechnical hazards; and providing geotechnical advices for the construction. The assessment is discussed in details in this report.

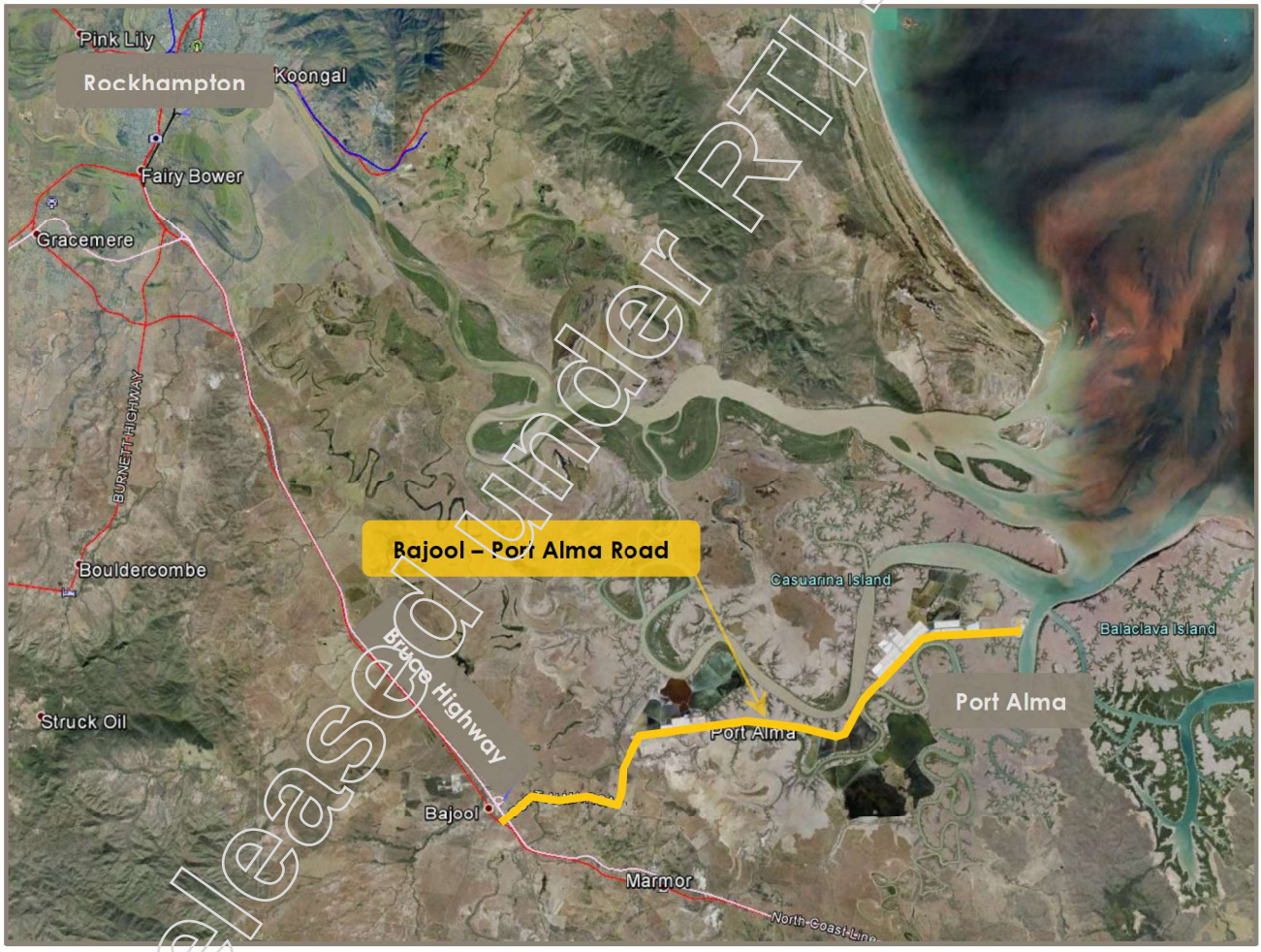


Figure 1-1: Project locality map (Source: Google Earth/Qld globe)

2. Site Description & Regional Geology

The road embankment is constructed mostly in coastal lowland area between two creeks flowing to Keppel Bay: Casuarina Creek and Inkerman Creek. Topography along the road alignment is relatively flat with very little vegetation coverage on the road sides. A typical road's section is illustrated in Figure 2-1 below.

Figure 2-1: Road Section at Chainage 25.22km

Reference to the Geological Survey of Queensland map, 1:250,000 series, Rockhampton Region, indicates approximately first 5km of the road from Bruce Highway is located within an area of Holocene alluvial deposits (Geology unit Qha) that typically comprises gravel, sand, silt and clay. Whereas, the rest of the road is underlain by another Holocene deposit that comprises of mangrove swamps, mud flats or marine clay (geology unit Qhm).

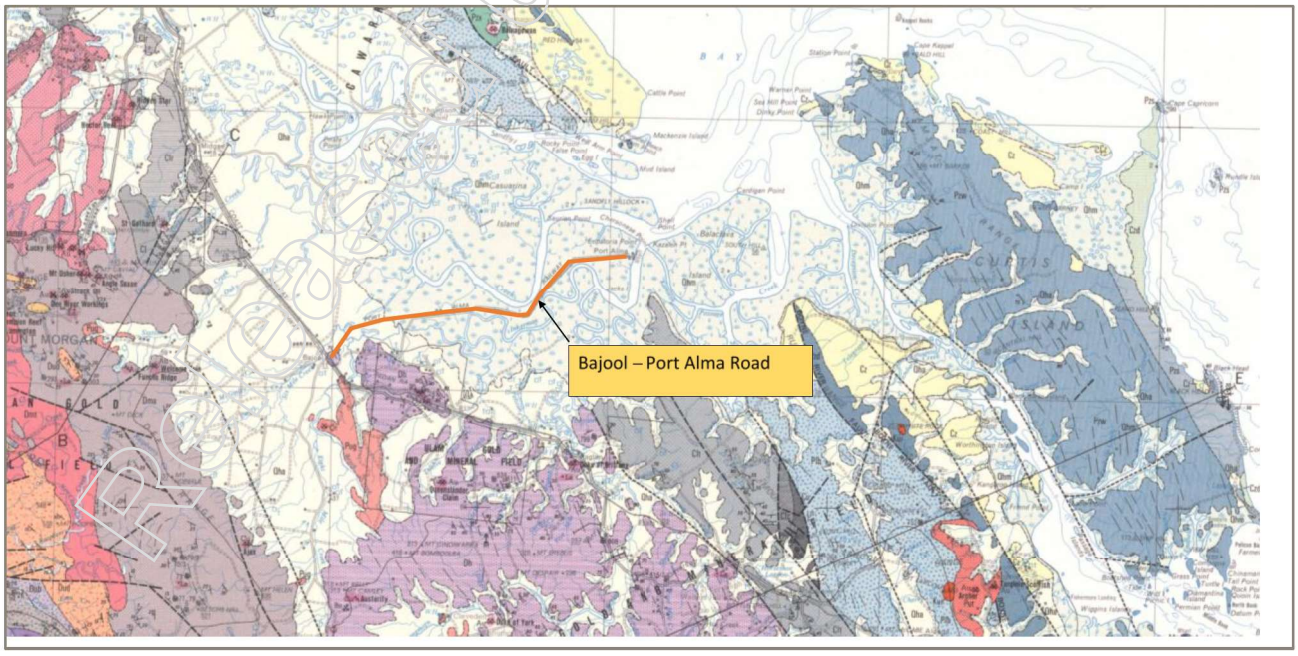


Figure 2-2: Regional Geology Map (Extracted from 1:250,000 Rockhampton Geology Map)

3. Available Site Investigation Information

There is limited site investigation information available for Bajool – Port Alma Road. Four (4) site investigation documents have been provided by DTMR for review. These investigations were primarily undertaken for pavement design purposes. The reports are listed below:

1. Port Alma Road – Pavement and Subgrade Investigation Report (Report No. 08/08), issued in April 2008
2. Test Pit Logs and In-situ CBR Results, as a part of Port Alma Road – Maintenance Report (Report No. 42542), issued in February 2016
3. Bajool – Port Alma Road CH 19.7km - 25.3km Pavement Investigation Report (Report No. 7/18) issued in July 2018
4. Acid Sulphate Soils, Bajool – Port Alma Area, issued in 2007.

These referenced documents are attached in Appendixes B, C, D and E.

4. Summary of Field Work

Site investigations, along Bajool – Port Alma Road, have been undertaken on three separate occasions; i.e. in 2008, 2016 and 2018. The total number of boreholes and their associated chainage ranges are listed below:

- Ten (10) investigation holes and one (1) trench between Chainage 0.0km – 19.8km were excavated in 2008.
- Five (5) investigations holes between Chainage 19.8km – 25.3km were completed in July 2018 as a part of the site investigation for the road upgrade's detailed design.
- Nine (9) investigation holes between Chainage 25.3km – 26.5km were conducted in 2016 for pavement maintenance purpose.

All of the site investigation work carried out to date has been managed by DTMR adopting a consistent approach and standards. The investigation holes were generally excavated using conventional excavator with the average excavation depth of 0.5m. At each hole, one Dynamic Cone Penetrometer (DCP) test was conducted up to 1.4m depth to estimate the CBR of the subgrade materials. Most of the investigation holes are located along the edge of seal or shoulder of the road to minimise disturbance to traffic.

Its noted that the gazetted chainage runs in an eastern direction starting from the intersection with the Bruce Highway in the west through to Port Alma. Therefore, the eastbound lane to Port Alma has been identified as the Left Hand Side (LHS) and the westbound lane as the Right Hand Side (RHS).

A summary table of the investigation holes, and sub-surface conditions is provided as Table 4-1. The hole testing locations are presented within the drawing set attached as Appendix A of this report.

Table 4-1: Field Work Summary and Sub-surface Conditions

				Soil Layer Thickness (m)					
Investigation Year	Chainage (km)	Hole / Trench ID	Depth [1] (m)	Base	Subbase	Subgrade (Foundations)	Subgrade Material	CBR (%) of Subgrade [2]	Location [3]
2008	4.73	1	0.80	0.25	0.23	0.285	CH (organic)	11 - 60	1.1m RHS of CL
2008	6.82	2	1.00	0.24	0	0.711	CH (organic)	4 - 5	1.1m RHS of CL
2008	7.53	3	1.20	0.32	0.13	0.7	CH (in-organic)	1.5 - 7.5	1.1m RHS of CL
2008	10.37	Trench	0.70	0.1-0.2	0.1-0.25	0.7	CH (in-organic)	5 - 11	1.1m RHS of CL
2008	11.16	4	1.10	0.36		0.71	CH (in-organic)	2.5 - 15	1.1m RHS of CL
2008	16.98	5	0.60	0.15	0.1	0.33	GM-GC	24 - 60	1.1m RHS of CL
2008	17.27	6	0.90	0.24		0.7	GM-GC	8 - 38	1.1m RHS of CL
2008	17.80	7	1.10	0.39		0.7	GM-GC	24 - 60	1.1m RHS of CL
2008	18.20	8	1.40	0.34	0.32	0.7	GM-GC	10 - 22	1.1m RHS of CL
2008	18.9	9	1.20	0.42		0.74	CL (in-organic)	2.5 - 10	1.1m RHS of CL
2008	19.7	10	1.00	0.23	0.1	0.7	GC	9.5 - 60	1.1m RHS of CL
2018	20.01	1	1.14	0.25	0.25	0.64	GP-GM	3 - 29	1.6m-2.6m RHS of CL
2018	20.01	1 (shoulder)	0.85	0.2	0.2	0.45	GP-GM	11 - 46	2.6m - 5.1m RHS of CL
2018	21.61	2	1.21	0.2	0.2	0.81	GM, ML	5 - 40	2.6m - 3.6m RHS of CL

				Soil Layer Thickness (m)					
Investigation Year	Chainage (km)	Hole / Trench ID	Depth [1] (m)	Base	Subbase	Subgrade (Foundations)	Subgrade Material	CBR (%) of Subgrade [2]	Location [3]
2018	21.61	2 (shoulder)	1.28	0.13	0.18	0.97	GM, ML	2 - 5	3.6m - 4.9m RHS of CL
2018	23.32	3	1.29	0.25	0.3	0.74	GM, ML	4.5 - 36	2.0m - 3.6m RHS of CL
2018	23.32	3 (shoulder)	1.22	0.15	0.2	0.77	GM, ML	1.5 - 6.5	3.6m - 5.2m RHS of CL
2018	24.38	4	0.98	0.2	0.18	0.60	GM, ML	7.5 - 60	2.2m - 3.8m RHS of CL
2018	24.38	4 (shoulder)	1.09	0.1	0.24	0.65	GM, ML	2 - 4	3.8m - 5.6m RHS of CL
2018	25.22	5	1.28	0.2	0.19	0.89	GM, ML	7 - 60	2.2m - 4.0m RHS of CL
2018	25.22	5 (shoulder)	1.00	0.15	0.15	0.60	GM, ML	1.5 - 6.5	4.0m - 5.4m RHS of CL
2016	25.32	8	1.25	0.34	0.2	0.71	CL-CI	15 - 27	RHS
2016	25.32	9	1.24	0.5	-	0.74	CH (Marine Clay)	1.5 - 3.0	3.0m from RHS Seal Edge
2016	25.65	6	1.33	0.26	0.23	0.84	CI-CH	12 - 42	RHS
2016	25.65	7	1.05	0.4	-	0.65	CH (Marine Clay)	1.0 - 2.5	2.5m from RHS Seal Edge
2016	25.99	4	0.70	0.27	0.22	0.21	CI-CH	12 - 36	RHS
2016	25.99	5	1.15	0.23	0.37	0.55	CH (Marine Clay)	3.5 - 14	2.0m from RHS Seal Edge
2016	26.24	3	1.29	0.56	-	0.73	GM-GC	4 - 60	4m from RHS Seal Edge
2016	26.46	2	1.20	0.58	-	0.62	GP	9 - 27	4m from RHS Seal Edge

				Soil Layer Thickness (m)					
Investigation Year	Chainage (km)	Hole / Trench ID	Depth [1] (m)	Base	Subbase	Subgrade (Foundations)	Subgrade Material	CBR (%) of Subgrade [2]	Location [3]
2016	26.48	1	1.23	0.5	-	0.73	GM-GC	15-40	RHS

1. Investigation Depth taken into account DCP testing depth
2. CBR were estimated from DCP tests
3. Indicate the offset distance from the road's Centre Line (CL)

5. Summary of Laboratory Test Results

Disturbed or bulk samples obtained from the investigation holes were transported to laboratories for testing. For base and subbase materials, tests for grading and moisture content were conducted. Fine contents of the samples were separated and tested for Atterberg's limits and linear shrinkage. California Bearing Ratio (CBR) tests were also performed on remoulded samples that were compacted to 100% of standard maximum dry density (SMDD).

For subgrade materials, besides DCP tests and moisture content tests being undertaken on site, disturbed samples of subgrade materials were also tested for grading, Atterberg's limits and linear shrinkage. CBR tests were also undertaken on subgrade samples that were compacted to 97% of SMDD.

As the site investigation work was targeted around pavement design, no shear or deformation tests have been undertaken to determine the shear strength and modulus of the foundation material. Therefore, the geotechnical parameters are unable to derive directly from the insitu soil material. Given the upgrade scopes of work are mainly related to pavement extension and shallow excavation for underground service installation, geotechnical parameters can be derived from published literature or experience working with similar materials.

In summary, the investigations undertaken to date appear to be adequate for the geotechnical analysis of the proposed upgrade works. A summary of the test results is provided within Table 5-1.

Table 5-1: Summary of Laboratory Test Results

Invest. Year	Chainage (km)	Hole / Trench ID	Soil Type	Material Type	MC (%)	LL (%)	PI (%)	LS (%)	SMDD (%)	OMC (%)	CBR (%)	Percentage (%) in Weight		
												Gravel	Sand	Fine Content
2008	4.73	1	GM	Base	8.1	35.2	6.6	4.2	2.00	10.6	46	50	41.1	8.9
2008	6.82	2	GM	Base	6.3	30.4	6.2	4	1.997	10.4	36	48	34	18
2008	6.82	2	CH	Subgrade	26.6	52.6	31.8	17	1.548	22.3	2	3	7	90
2008	7.53	3	GC	Base	4.8	25.2	8.4	5.2	2.162	8	21	43	39	18
2008	7.53	3	SC	Sub-base	-	28.2	8.2	4	2.152	8	80	30	57	13
2008	7.53	3	CH	Subgrade	35.4	79.6	56.8	18.4	1.495	23.8	1	1	1	98
2008	10.37	Trench	SC	Base	5	23.6	7.6	5	2.132	8	60	39	39	22
2008	10.37	Trench	CI	Subgrade	31.3	44.8	24.6	12.8	1.492	25.4	3.5	9	5	86
2008	11.16	4	GC	Base	4.9	27.2	9.4	5.2	2.168	7.8	34	51	28	21
2008	11.16	4	CH	Subgrade	28.5	51.8	28.2	15.4	1.536	23.2	2	3	4	93
2008	17.27	6	GC	Base	7.3	24.8	8	4.8	2.103	8.5	44	53	30	17
2008	17.27	6	GM-GC	Subgrade	7.5	30.8	8.4	4.2	1.907	11.4	10.5	37	23	40
2008	17.80	7	GM	Subgrade	4.9	32.2	8.8	3.2	1.973	10.5	28	50	19	31
2008	18.20	8	GC	Base	6.5	26.4	8	5.8	2.094	9.5	30	45	40	15
2008	18.20	8	GM-GC	Subgrade	15.8	32.6	8.6	4.4	1.943	10.5	17	42	15	43

												Percentage (%) in Weight		
Invest. Year	Chainage (km)	Hole / Trench ID	Soil Type	Material Type	MC (%)	LL (%)	PI (%)	LS (%)	SMDD (%)	OMC (%)	CBR (%)	Gravel	Sand	Fine Content
2008	18.9	9	GC	Base	6.2	25.2	8.8	5.6	2.161	7	92	46	34	20
2008	18.9	9	CL	Subgrade	10.7	32.4	7	2.6	1.814	15.7	11	32	13	55
2008	19.7	10	GC	Base	7.6	28.5	8.2	5.4	2.093	9.4	44	53	32	15
2008	19.7	10	GC	Subgrade	16.3	31.6	9.2	3.8	1.91	11.2	17	44	19	37
2018	20.01	1	GP	Base	-	32.2	3.4	3.0	1.98	10.9	56	55	35.6	9.4
2018	20.01	1	GP	Subbase	-	24.6	5.0	3.2	2.10	7.8	70	60	28	12
2018	20.01	1	ML	Subgrade	20.5	34.4	6.8	3.8	1.89	14.7	9.0	31	20	49
2018	20.01	1 (shoulder)	GP	Base	-	26.4	5.4	3.4	2.12	7.8	40	40	39	21
2018	20.01	1 (shoulder)	GM	Subbase	-	28.8	7.8	4.2	2.02	10.9	15	44	27	29
2018	20.01	1 (shoulder)	ML	Subgrade	16.9	34.8	8.8	4.4	1.86	13.9	8.0	35	18	47
2018	21.61	2	GP	Base	-	35	5.0	3.4	1.91	11.1	20	40	32	28
2018	21.61	2	GM	Subgrade	35.8	32.8	7.4	2.8	1.90	13.0	15	36	22	42
2018	23.32	3	GM	Subgrade	14.9	32.8	6.2	3.4	1.85	14.1	9.0	40	22	38
2018	24.38	4	GM	Subgrade	10.5	33.6	6	2.2	1.95	12.4	23	40	24	36
2018	25.22	5	ML	Subgrade	13.7	36.6	6.2	3.0	1.91	13.0	11	35	17	48

6. Sub-surface Conditions

As mentioned in the previous section, the site investigations undertaken to date were primarily for pavement design purposes. Therefore, the tests have generally been limited to a depth of 1.4m below the existing finish surface levels. Ground conditions encountered in the investigation holes comprised of base and subbase materials on the top 0.4m – 0.6m. The base materials include silty sandy gravels that are poorly graded, light to dark brown with some low plasticity silts. The subbase materials generally slightly finer in particle sizes and comprise of gravelly sand or sandy gravel.

Underneath the subbase materials, various subgrade or foundation soils were encountered along the road alignment and they are discussed below.

- Sections between Chainage 4.7km – 6.9km: high plasticity clayey soils with organic contents were encountered.
- Sections between Chainage 7.5km – 11.1km: subgrade materials are inorganic high plasticity clayey soils.
- Sections between Chainage 16.9km – 25.2km and Chainage 26.2km – 26.5km: Silty Sand or Sandy Silt with some gravels that are generally brown / black and moist were encountered below the base / subbase materials. They are likely embankment fill.
- Sections between Chainage 25.3km – 26.0km: Low to high plasticity clay or marine clay were encountered.

According to the regional geology setting, it is likely that the subgrade / foundation materials underneath the road embankment are Holocene Alluvial deposit that are typically weak, highly compressible with low insitu CBR (1% – 5%).

The investigation logs indicate the materials encountered within the investigation depth are moist. Between Chainage 25.32km – 25.95km, the subgrade materials are marine clays that were wet at the time of investigation. This indicates the saturated level is very close to the existing finished road surface in these locations. It should be noted that groundwater depths and ground moisture conditions are affected by climatic conditions and soil permeability, thus may vary with time.

7. Acid Sulfate Soils (ASS)

Acid sulfate soils (ASS) are soils and sediments containing iron sulphides that, when disturbed and exposed to oxygen, generate sulfuric acid and toxic quantities of aluminium and other heavy metals. The sulfuric acid and heavy metals are produced in forms that can be readily released into the environment, with potential adverse effects on the natural and built environment and human health.

In 2007, Queensland government carried out a detailed investigation in ASS for Bajool – Port Alma Area. As a result, a detailed 1:50,000 scale Acid Sulfate Hazard Maps of the area, in Appendix E, was produced. According to the ASS investigation, Bajool – Port Alma road from approximate Chainage 10km is in the area where the potential ASS is between 0.5m and 3m below the existing ground.

The acid generation potential was classified from moderate to high with sulphides concentration of more than 0.35%. The high sulphides concentration are mostly occur in shallow depth and associated with clayey sediment. Therefore, it is likely that the trench excavation for underground power cable installation disturbs high concentration ASS beneath. Its recommended appropriate environmental ASS management plan will be required to minimise the risk of acidic liquid being generated and leaked into the environment.

8. Recommendations

8.1 ASS Management & Treatment

Several ASS management methods are proposed in Queensland Acid Sulphate Soil Technical Manual (Dear et. al. 2002) such as:

- Minimisation of disturbance by carefully planning and design for the excavation.
- Neutralised ASS by mixing with suitable agents such as lime, gypsum.
- Hydraulic separation.
- Strategic Reburial of ASS below the permanent groundwater table.

As the ASS is expected in the shallow depth, it is likely that excavation into ASS cannot be avoided. Therefore, it is recommended the excavated ASS should be treated with neutralising agents within on-site treatment pad. This is a popular treatment adopted in Queensland regional and has been proved to be an effective method in several projects. The amount of neutralised agent is dependent on sulphite concentration which may vary depending on specific locations. Hence, it is recommended that a representative site engineer manages the ASS issues.

The excavated ASS materials after treatment can be reused if they are satisfied the specifications of back fill / engineering fill or be disposed in an appropriate landfill. To minimise the soil exposure, it is recommended the excavation is backfilled as soon as possible. The excavation face and floor in ASS must be treated with neutralising agents if they are exposed to the air overnight for coarse grained ASS or up to five (5) days for fine grained ASS.

8.2 Excavatability

It is understood that majority of the excavation will be related to the installation of underground power cables and most of the trench will be limited to a 2m depth. Based on the project sub-surface conditions, it is expected that the excavation of materials could be undertaken by conventional excavation plant, such as backhoes and 20 to 30 tonne hydraulic excavators. Rock breakers may be occasionally required for removal of localised rocks, if encountered.

8.3 Batter slopes

The stability of temporary batter slopes and excavations may be variable, due to the potential variation in soil types and saturated or ground water level. Geotechnical assessment indicates slope angle for temporary excavation should not be steeper than:

- 5V:1H for excavation up to 1.0m depth
- 1V:1.5H for excavations up to 2m depth

Otherwise, trench support (i.e. trench boxes) should be utilised. For permanent batter slopes of up to 2m depth, a slope angle of 1V:2H is recommended with a friction angle of 24 degrees and cohesion of 2 kPa being assumed for the alluvial deposit. Long term slopes in engineered filling, or alluvial soils may require surface protection to reduce the risk of erosion potential.

It should be noted that the proposed slope batter was based on the dry soil conditions. If conditions vary from the above assumption, for examples excavation in high saturated level area or deep excavation (more than 3m), individual geotechnical design package should be undertaken.

8.4 Re-used of Excavated Materials

Soils from shallow trench excavation are likely to be variable in composition and organic content. Excluding the base, subbase and embankment fill that can be reused as engineering fill, clayey materials with organic content as encountered between Chainage 4.7km – 6.9km may not be suitable for use as engineering fill.

If considered for re-use, in-organic clay may require moisture conditioning, either drying out or wetting up to be within acceptable limits, as confirmed from compaction testing. Naturally occurring granular soils are likely to be suitable for re-use as engineered fill without treatment. Use of silt rich material should be avoided.

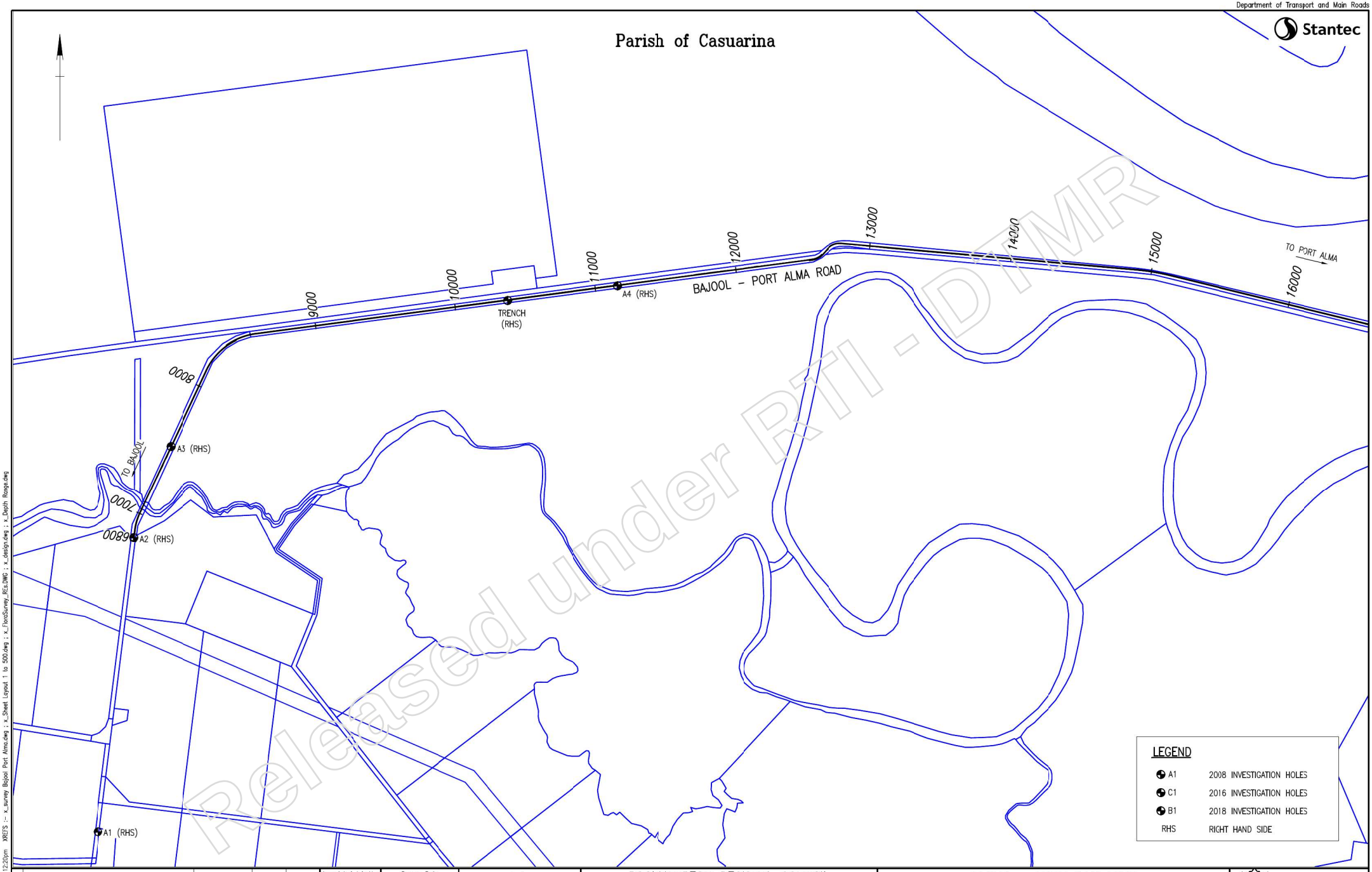
Topsoils obtained from the excavation can be kept and reused for landscaping purpose. It should be noted that the road is located in the area in which soils is classified as very high potential of acid generation, the subgrade materials won from excavation should be have pH tested before being reused.

Appendices

Appendix A LOCATION PLAN OF SITE INVESTIGATION HOLES / TRENCHES

Stantec

Parish of Casuarina



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Geotechnical Borehole Sketch

Revisions/Descriptions	Certification	Date	Microfiled

CAD FILES | C:\pwworkdir\qp_projects01\dms97746\GE-01.dwg

Associated Job Nos

Auxiliary Drg Nos

Survey Data: Datum | Horiz. Grid | Height Origin | Survey Books

Scales: 1:12000 0 100 200 300 400m

Dimensions shown in except where shown otherwise

ROCKHAMPTON REGIONAL COUNCIL

BAJOOL – PORT ALMA ROAD

CTL CHGE

Reference Points

Preceding RP	Dist. to start of job (km)	From start to end of job	From end to Following RP	Following RP

Through Chainage from

BAJOOL – PORT ALMA ROAD GEOTECHNICAL ASSESSMENT BORE HOLE LOCATIONS – SHEET 1 OF 2

Drawn: D. GHUNDRE

Designed

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

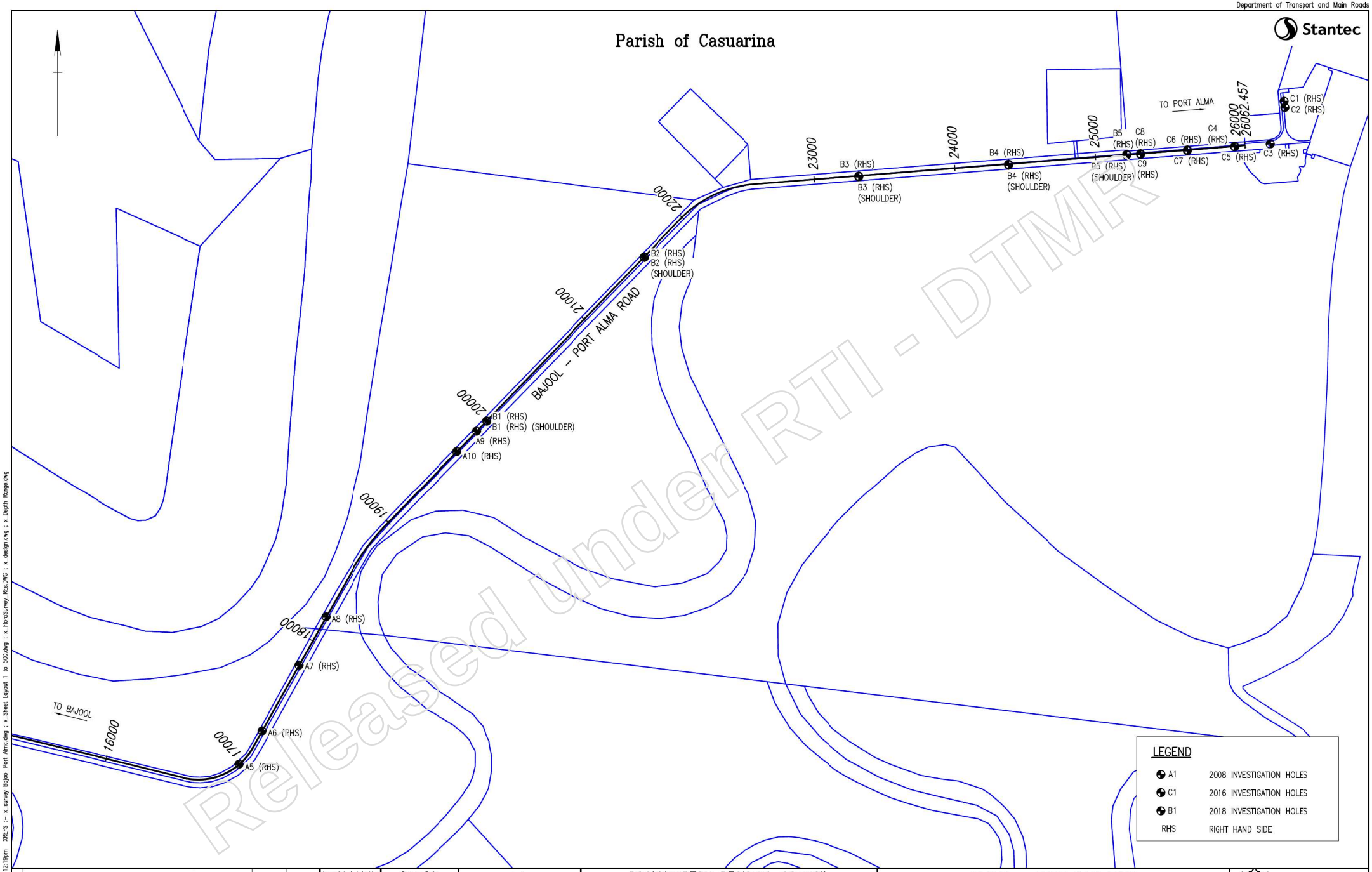
Queensland Government

Job No.	
Contract. No.	
Drawing No.	A
Series Number	01 of 02

WRR_Detail (02/14)

Stantec

Parish of Casuarina



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Geotechnical Borehole Sketch

Revisions/Descriptions	Certification	Date	Microfiled

CAD FILES | C:\pwworkdir\qp_projects01\dms97746\GE-02.dwg

Associated Job Nos

Auxiliary Drg Nos

Survey Data: Datum | Horiz. Grid | Height Origin | Survey Books

Scales: 1:12000 0 100 200 300 400m

Dimensions shown in except where shown otherwise

ROCKHAMPTON REGIONAL COUNCIL

BAJOOL – PORT ALMA ROAD

CTL CHGE

Reference Points

Preceding RP	Dist. to start of job (km)	From start to end of job	From end to Following RP	Following RP

Through Chainage from

BAJOOL – PORT ALMA ROAD GEOTECHNICAL ASSESSMENT BORE HOLE LOCATIONS – SHEET 2 OF 2

Drawn: D. GHUNDRE

Designed

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

Queensland Government

Job No.

Contract. No.

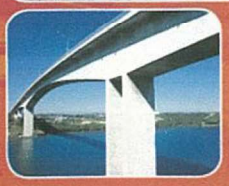
Drawing No. A

Series Number 02 of 02

WRR_Detail (02/14)

Appendix B PORT ALMA ROAD – PAVEMENT AND SUBGRADE INVESTIGATION REPORT, REPORT NO. 08/08 (ISSUED IN APRIL 2008)







Main Roads

Connecting Queensland

Materials Services (Rockhampton)

Pavement and Subgrade Investigation
Port Alma Road

54/41F/507

Client: Manager PD & D
Main Roads Rockhampton

Date Issued: April 2008
Report No: 08/08

Queensland Government
Department of Main Roads

Materials Services (Rockhampton)

Pavement and Subgrade Investigation
Port Alma Road
54/41F/507

Client: Manager PD & D
Main Roads Rockhampton

Date issued: April 2008

Report No: 08/08

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Photo's A7-33, 34, 35 & 36	Section 5, Site 2	Appendix 7
Photo's A7-37, 38, 39 & 40	Section 6, Site 1	Appendix 7
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1. Introduction

A Pavement Investigation was conducted by the Rockhampton Materials Services Unit on Port Alma Road, following a request by Senior Engineer R. Hicks of Manager (PD & D) Rockhampton. A copy of the request is included in *Appendix 1.* The investigation involved sampling and testing of the pavement and subgrade materials on the 6th and 7th March 2008.

2. Location

The Investigation consisted of ten potholes and a single trench conducted along a section of the Port Alma Road, Ch 0.0 – 19.8km. All distance measurements are through distances based on the Main Roads reference point system and are shown in kilometres unless otherwise stated. The sampling locations were nominated by the client.

All offset measurements are in metres and are referenced to the existing Centre Line (CL) unless otherwise stated. All depth measurements were taken from the surface level at each of the locations unless otherwise stated. The one general exception to this is for the DCP depths shown in *Appendix 4* that are shown as below the subgrade level.

The lanes tested may be identified in abbreviated form in this report or its attachments. The inbound Port Alma lane may be identified as inbound, eastbound, or LHS and the outbound Port Alma Lane may be identified as outbound, westbound, or RHS.

For the purpose of this report the term subgrade includes all material below the pavement layers in the roadway and shoulder.

3. Sampling

Technologist M. J. Wilson and Soil Tester D. Roberts from the Rockhampton Laboratory performed the sampling on the 6th and 7thMarch 2008. Disturbed samples of the pavement material and subgrade were taken from each location using a mini-excavator. The sampling method used is shown on the test reports. Photographs of the sites, potholes and trenches are shown in *Appendix 7.*

The sample descriptions, depths, laboratory sample numbers and test descriptions are shown in the sampling log in *Appendix 3.*

The sample descriptions are based on the system used in AS 1726-1993 "Geotechnical Site Investigations", *Appendix A.*

Where the classification group symbol is shown in brackets the classification is based on field observation. Where the classification symbol is shown without brackets the classification is based on observations and confirmed by laboratory testing.

4. Pavement Sampling and Testing

Disturbed samples of the base and subbase materials where present were taken from the pavement at each of the nominated locations. Representative samples of each variation in material were tested for grading, liquid limit, plastic limit, linear shrinkage, moisture content and single point CBR (100% STD). The test results are summarised in *Appendix 2,* copies of the test reports are included in *Appendix 5.* A summary of typical properties is presented below in tables 6-1 and 6.2.

5. Subgrade Sampling and Testing

Disturbed samples of the subgrade material were taken from each location and tested for grading, liquid limit, plastic limit, linear shrinkage and single point CBR (97% STD). A single in situ CBR test (DCP) and moisture content was performed at each location. The test results are summarised in *Appendix 2,* copies of the in situ CBR reports are included in *Appendix 4,* and copies of the laboratory test reports are included in *Appendix 6.* A summary of typical properties is presented below in table 6-3.

6. Summary of Material Properties

6.1 Pavement Material (Base): The base materials encountered at sections 1-6 were tested (Grading, Atterberg Limits and Single point CBR [100% STD]) and identified as predominantly Clayey Sandy Gravel. Results of the tests are summarised in *Table 6-1* below.

The Insitu materials were mostly moist.

Table 6-1 *Typical Properties – Pavement Material (Base)*

Location		Material Description	Linear Shrinkage Range (Average)	Plasticity Index Range (Average)	CBR Range (Average)
Section	Site No.(s)				
1	1	Silty Sandy Gravel	4.0 – 4.2 (4.1)	6.2 – 6.6 (6.4)	36 – 46 (41)
2	1				
2	2	Clayey Sandy Gravel	4.8 – 5.8 (5.4)	8.0 – 9.4 (8.3)	21 – 92 (40)
3	1				
4	1 & 2				
5	1 & 2				
6	1 & 2				
3	2	Clayey Sandy Gravel / Gravelly Sand	4.0 – 5.0 (4.5)	7.6 – 8.2 (7.9)	60 – 80 (70)

6.2 Pavement Material (Subbase): The subbase materials encountered at sections 2-4 were tested (Grading, Atterberg Limits and Single point CBR [100% STD]) and identified as Clayey Gravelly Sand. Results of the tests are summarised in *Table 6-2* below.

The Insitu materials were mostly moist.

Table 6-2 *Typical Properties – Pavement Material (Subbase)*

Location		Material Description	Linear Shrinkage Range (Average)	Plasticity Index Range (Average)	CBR Range (Average)
Section	Site No.(s)				
2	2	Clayey Gravelly Sand	4.0 – 4.8 (4.4)	8.0 – 8.2 (8.1)	40 – 80 (62)
4	1				
3	2				

6.3 Subgrade Material: The subgrade materials from sections 1-6 were tested (Grading, Atterberg Limits, and Single point CBR [97% STD]) and identified as predominantly Organic Clay or Sandy Clayey Gravel. Results of the tests are summarised in *Table 6-3* below.

The Insitu materials were moist.

Table 6-3 *Typical Properties – Subgrade Material*

Location		Material Description	Linear Shrinkage Range (Average)	Plasticity Index Range (Average)	CBR Range (Average)
Section	Site No.(s)				
1	1	Organic Clay	12.8 – 18.4 (16.1)	24.6 – 56.8 (34.6)	1.0 – 3.5 (2.0)
2	1 & 2				
3	1				
4	1 & 2	Sandy Clayey Gravel	2.6 – 4.4 (3.8)	7.0 – 9.2 (8.3)	10.5 – 17 (13)
5	2				
6	2				
5	1	Sandy Silty Gravel	3.2	8.8	28

In addition to the standard 4 day soaked CBR that was conducted on the subgrade material retrieved from Pothole 2 Section 2, a further 10 day soaked CBR was also undertaken, the results for which are summarised below in *Table 6-4*.

Table 6-4 *4 and 10 Day Soaked CBR Comparison*

	4 Day Soak	10 Day Soak
CBR Value	1.0	0.8

M.J. Wilson
Technologist
Main Roads (Rockhampton)

Appendix 1

Investigation Request

Request for Field Investigation, Sampling and Data Collection Services

Road: BRUCE HWY (10T & 10E) PORT ALMA RD (183) **Job No.** T.B.A.

Location: FAILURES @ VARIOUS LOCATIONS (REF. ON-SITE)

Proposed Works: REHAB. + CENTRE. WIDE. + MAKE-UP MATERIAL (IF REQ'D).

1. Scope of Services Requested

With regard to the above project, it is requested that the following services, as detailed in the "Standard Brief for Field Investigation, Sampling and Data Collection", be carried out and reported :-

No. 1 ~~(a) Trenching. or~~ (b) Potholing
No. 2 Field Notes / Insitu Testing – (a), (b), (c)
No. 3 Road Pavement Sampling.
~~No. 4 Shoulder Pavement Sampling.~~
No. 5 Subgrade Sampling
~~No. 6 Deflection Bowls (Benkelman Beam).~~
~~No. 7 Pre-Testing Consultation~~
No. 8 Reports

2. Sampling Locations

The locations for trenching, field investigation and sampling have been marked on the bitumen seal edge as per the following table using a local 0.0 km reference.

Road Marking				Required Trench Location	"New Shoulder Point" offsets from Centre Line	
No.	Location	Distance	Comments		Left	Right
LOCATIONS TO BE DETERMINED						
ON-SITE						
	Trenches @ approx	$	each = $	(Est. Total)		

Should you require any further information, please don't hesitate to contact me.

Test Report – Date Required By :-

A.S.A.P.
(SORRY ABOUT THE SHORT NOTICE)

Signed NR Date 2/3/08

Position SE - CMO.

DEPARTMENT OF MAIN ROADS – CENTRAL DISTRICT

Standard Brief
for
Field Investigation, Sampling and Data Collection Services

1 Field Excavations

(a) ~~Trenches~~

(i) locations – chainages ~~as per the "Field Investigation and Sampling Request"~~.
(ii) extent – from approx. the inner wheel ~~path through the shoulder~~ to daylight or "new shoulder point"
(iii) depth – top 300 mm of the subgrade.

(b) Potholes

As Determined On-site.

(i) locations – ~~chainages as per the "Field Investigation and Sampling Request"~~.
(ii) Positions – ~~Inner and outer wheel paths, and the shoulder or "new shoulder point"~~.

2 Field Notes / Insitu Testing.

(a) Local Influences Description

(i) formation (good, below surrounding ground levels, in cutting, high fill etc.)
~~(ii) pavement deformation (rutting, depressions, shoving etc.)~~
~~(ii) wearing surface width (seal edge to centerline) and condition (describe any shoving, corrugations, cracking etc., and pothole frequency – high, low none).~~
(iii) tabledrain condition (well maintained, filled up, none etc., and include approx. depth and offset from existing seal edge).

(b) Road Pavement and Shoulder Pavement Configurations

(i) pavement configuration sketches at each trench location ~~(particularly the road pavement/shoulder pavement joint to enable the cutback point to be defined – this is especially relevant when the old road has been previously widened)~~.
(ii) photographs at each trench site.

(c) Subgrade

At Location Determined On-Site.

(i) D.C.P's – ~~one each under the existing I.W.P. and O.W.P., and "new shoulder point"~~ (to 500-1000mm below subgrade level or refusal)
~~(ii) shear vane strength test (if the subgrade is suspected during field investigations, of being classified as unsuitable material or could present construction difficulties)~~
(iv) make particular note of any perched water tables.
~~(v) field assessment of rippability of any rock encountered.~~
~~(vi) field assessment and testing if acid sulphate soils are suspected~~
~~(vii) field assessment and testing if sodic soils are suspected~~

3 Road Pavement Sampling– obtain sufficient sample materials to carry out the following laboratory testing for each different pavement layer:-

~~(i) CBR (soaked, single point, @ OMC and 100% std. compaction).~~
~~(ii) grading.~~
~~(iii) Atterberg limits.~~
~~(iv) degradation factor~~
(v) suite of tests to determine cement content necessary to achieve 1 MPa - UCS (sample only top 200mm of each pavement).
~~(vi) any additional testing considered relevant as a result of the field investigations.~~

~~4 Shoulder Pavement Sampling– obtain sufficient sample materials to carry out the following laboratory testing for each different pavement layer:-~~

~~(i) CBR (soaked, single point, @ OMC and 100% std. compaction).~~
~~(ii) grading.~~
~~(iii) Atterberg limits.~~
~~(iv) degradation factor~~
~~(v) suite of tests to determine cement content necessary to achieve 1 MPa - UCS (sample only top 200mm of each pavement~~
~~(vi) any additional testing considered relevant as a result of the field investigations~~

5 Subgrade Sampling

(i) CBR (soaked, single point, @ OMC and 97% std. compaction).
~~(ii) Potential Swell for expansive subgrades (PI>25)~~
(iii) Atterberg limits.
(iv) insitu MC ~~under the existing I.W.P and O.W.P., and the "new shoulder point"~~. AT THE LOCATION DETERMINED ON-SITE
~~(v) W.P.I (if the subgrade is suspected during field investigations, of being classified as unsuitable material).~~
~~(vi) acid sulphate soil tests (if suspected during field work).~~
~~(vii) any additional testing considered relevant as a result of the field investigations~~

~~6 Deflection Bowls (Benkelman Beam)~~

~~Benkelman Beam deflection data should be obtained for the I.W.P. and O.W.P. of both lanes at 50m intervals. These 50m intervals should be staggered between the L.H.S. and R.H.S. lanes.~~

~~7 Sample Testing~~

~~Following sampling and any relevant field investigation results, testing requirements will be finalized in consultation with laboratory staff~~

8 Reports SUMMARY & TEST RESULTS ONLY

Design Information

Two (2) copies of the Testing Report are to be supplied to the District Office, one (1) to central records and one (1) to the pavement designer.

~~Environmental Information~~

(i) If acid sulphate or sodic ~~soils~~ are not encountered, a brief e-mail to that effect is to be sent to the district environmental unit (include sampling chainages)
(ii) If acid sulphate or sodic soils are encountered, one (1) ~~copy of the~~ relevant field investigation notes and relevant sample testing results are to be forwarded to the district environmental unit for their records and data base.

Appendix 2

Summary of Results

Maybe refer DCP for thickness

Table A2-1 Summary of Testing – Base Material

Location					Particle Size Distribution									Atterberg Limits						CBR						Insitu MC	USC
Article No.	Trench/ Pothole	Dist. (km)	Location	Thickness (mm)	75	53	37.5	19	9.5	4.75	2.36	0.425	0.075	LL	PI	LS	PIX425	LSX425	75/425	MDD	Comp DD	OMC	Comp MC	CBR	Cond		
R08/0302	Pothole 1 Section 1	4.726	1.1m R of CL	220	-	-	100	98	85	73	50	23	8.9	35.2	6.6	4.2	152	97	0.39	2.004	2.009	10.6	10.3	46	Skd	-	GM
R08/0303	Pothole 1 Section 1	4.726	1.1m R of CL	200 ~~330~~	(-)	(-)	(100)	(99)	(95)	(85)	(70)	(32)	(13)	(28.2)	(8.2)	(4.0)	(264)	(129)	(0.41)	(2.152)	(2.156)	(8.0)	(7.8)	(80)	(Skd)	-	(SC)
					Material not tested; visually assessed as being the same as section 2 pothole 2 subbase, Article no. R08/0311.																						
R08/0306	Pothole 1 Section 2	6.822	1.1m R of CL	210	-	-	100	94	77	61	52	34	18	30.4	6.2	4.0	210	135	0.55	1.997	1.997	10.4	10.4	36	Skd	-	GM
R08/0310	Pothole 2 Section 2	7.526	1.1m R of CL	290	-	100	97	87	75	65	57	32	18	25.2	8.4	5.2	270	167	0.57	2.162	2.166	8.0	7.8	21	Skd	-	GC
R08/0312	Pothole 2 Section 2	7.526	1.1m R of CL	100 ~~120~~	(98)	(94)	(91)	(82)	(68)	(56)	(47)	(28)	(17)	(24.8)	(8.0)	(4.8)	(222)	(133)	(0.62)	(2.103)	(2.099)	(8.5)	(8.7)	(44)	(Skd)	-	(GC)
					Material not tested; visually assessed as being the same as section 4 pothole 2 base, Article no. R08/0328.																						
R08/0315	Trench 1 Section 3	10.372	1.4-3.2m R of CL		-	100	97	86	72	66	61	40	22	23.6	7.6	5.0	303	200	0.54	2.132	2.134	8.0	7.9	60	Skd	-	SC
R08/0322	Pothole1 Section 3	11.158	1.1m R of CL	320	-	100	97	93	71	56	49	29	21	27.2	9.4	5.2	272	150	0.72	2.168	2.168	7.8	7.8	34	Skd	-	GC
R08/0325	Pothole 1 Section 4	16.983	1.1m R of CL	120	(-)	(100)	(97)	(84)	(72)	(63)	(55)	(28)	(15)	(26.4)	(8.0)	(5.8)	(222)	(161)	(0.54)	(2.094)	(2.091)	(9.5)	(9.7)	(30)	(Skd)	-	(GC)
					Material not tested; visually assessed as being the same as section 5 pothole 2 base, Article no. R08/0333.																						
R08/0328	Pothole 2 Section 4	17.270	1.1m R of CL	210	98	94	91	82	68	56	47	28	17	24.8	8.0	4.8	222	133	0.62	2.103	2.099	8.5	8.7	44	Skd	-	GC
R08/0331	Pothole 1 Section 5	17.803	1.1m R of CL	360	(-)	(100)	(97)	(84)	(72)	(63)	(55)	(28)	(15)	(26.4)	(8.0)	(5.8)	(222)	(161)	(0.54)	(2.094)	(2.091)	(9.5)	(9.7)	(30)	(Skd)	-	(GC)
					Material not tested; visually assessed as being the same as section 5 pothole 2 base, Article no. R08/0333.																						
R08/0333	Pothole 2 Section 5	18.195	1.1m R of CL	310	-	100	97	84	72	63	55	28	15	26.4	8.0	5.8	222	161	0.54	2.094	2.091	9.5	9.7	30	Skd	-	GC
R08/0336	Pothole 2 Section 5	18.195	1.1m R of CL	290	(-)	(100)	(97)	(84)	(72)	(63)	(55)	(28)	(15)	(26.4)	(8.0)	(5.8)	(222)	(161)	(0.54)	(2.094)	(2.091)	(9.5)	(9.7)	(30)	(Skd)	-	(GC)
					Material not tested; visually assessed as being the same as section 5 pothole 2 base, Article no. R08/0333.																						
R08/0337	Pothole 1 Section 6	18.900	1.1m R of CL	390	-	100	99	94	76	60	54	34	20	25.2	8.8	5.6	0	193	0.59	2.161	2.157	7.0	7.2	92	Skd	-	GC
R08/0340	Pothole 2 Section 6	19.700	1.1m R of CL	200	100	96	90	78	65	56	47	26	15	28.5	8.2	5.4	211	139	0.60	2.093	2.092	9.4	9.4	44	Skd	-	GC
R08/0342	Pothole 2 Section 6	19.700	1.1m R of CL	50	(100)	(96)	(90)	(78)	(65)	(56)	(47)	(26)	(15)	(28.5)	(8.2)	(5.4)	(211)	(139)	(0.60)	(2.093)	(2.092)	(9.4)	(9.4)	(44)	(Skd)	-	(GC)
					Material not tested; visually assessed as being the same as section 6 pothole 2 base, Article no. R08/0340.																						

Table A2-2 Summary of Testing – Subbase Material

Location					Particle Size Distribution									Atterberg Limits						CBR						Insitu MC	USC
Article No.	Trench/ Pothole	Dist. (km)	Location	Thickness (mm)	75	53	37.5	19	9.5	4.75	2.36	0.425	0.075	LL	PI	LS	PIX425	LSX425	75/425	MDD	Comp DD	OMC	Comp MC	CBR	Cond		
R08/0311	Pothole 2 Section 2	7.526	1.1m R of CL	100	-	-	100	99	95	85	70	32	13	28.2	8.2	4.0	264	129	0.41	2.152	2.156	8.0	7.8	80	Skd	-	SC
R08/0317	Trench 1 Section 3	10.372	1.4-3.2m R of CL		(98)	(94)	(91)	(82)	(68)	(56)	(47)	(28)	(17)	(24.8)	(8.0)	(4.8)	(222)	(133)	(0.62)	(2.103)	(2.099)	(8.5)	(8.7)	(44)	(Skd)	-	(GC)
					Material not tested; visually assessed as being the same as section 4 pothole 2 base, Article no. R08/0328.																							
R08/0326	Pothole 1 Section 4	16.983	1.1m R of CL	100	(-)	(-)	(100)	(99)	(95)	(85)	(70)	(32)	(13)	(28.2)	(8.2)	(4.0)	(264)	(129)	(0.41)	(2.152)	(2.156)	(8.0)	(7.8)	(80)	(Skd)	-	(SC)
					Material not tested; visually assessed as being the same as section 2 pothole 2 subbase, Article no. R08/0311.																							

Table A2-3 Summary of Testing – UCS Results for Base Materials

Location					UCS	
Article No.	Trench/ Pothole	Dist. (km)	Location	Thickness (mm)	Target Strength (MPa)	Required Cement Content (%)
R08/0303	Pothole 1 Section 1	4.726	1.1m R of CL	220	1.0	3.5
R08/0307	Pothole1 Section 2	6.822	RHS	210	1.0	2.2
R08/0366	Pothole 2 Section 2	7.526	RHS	290	1.0	3.1
R08/0316	Trench 1 Section 3	10.372	1.8m R of CL	See Appendix 8	1.0	3.6
R08/0323	Pothole 1 Section 3	11.158	RHS	320	1.0	3.8
R08/0329	Pothole 2 Section 4	17.270	RHS	210	1.0	4.2
R08/0334	Pothole 2 Section 5	18.195	RHS	310	1.0	3.5
R08/0338	Pothole 1 Section 6	18.900	RHS	390	1.0	3.4
R08/0341	Pothole 2 Section 6	19.700	RHS	200	1.0	3.5

Table A2·4 Summary of Testing – Subgrade Material

Location					Particle Size Distribution									Atterberg Limits						CBR						Insitu MC	USC
Article No.	Trench/ Pothole	Dist. (km)	Location	Thickness (mm)	75	53	37.5	19	9.5	4.75	2.36	0.425	0.075	LL	PI	LS	PIX425	LSX425	75/425	MDD	Comp DD	OMC	Comp MC	CBR	Cond		
R08/0305	Pothole 1 Section 1	4.726	1.1m R of CL	-	(-)	(-)	(-)	(100)	(99)	(98)	(97)	(94)	(90)	(52.6)	(31.8)	(17.0)	(2999)	(1603)	(0.96)	(1.548)	(1.551)	(22.3)	(22.1)	(2.0)	(Skd)	-	(CH)
					Material not tested; visually assessed as being the same as section 2 pothole 1 subgrade, Article no. R08/0309.																						
R08/0309	Pothole 1 Section 2	6.822	1.1m R of CL	-	-	-	-	100	99	98	97	94	90	52.6	31.8	17.0	2999	1603	0.96	1.548	1.551	22.3	22.1	2.0	Skd	-	CH
R08/0313	Pothole 2 Section 2	7.526	1.1m R of CL	-	-	-	-	-	-	100	99	99	98	79.6	56.8	18.4	5600	1814	0.99	1.495	1.498	23.8	23.6	1.0	Skd	-	CH
R08/0318	Trench 1 Section 3	10.372	1.4-3.2m R of CL	-	-	-	100	99	97	94	91	89	86	44.8	24.6	12.8	2189	1139	0.96	1.492	1.489	25.4	25.7	3.5	Skd	-	CI
R08/0324	Pothole 1 Section 3	11.158	1.1m R of CL	-	-	-	-	100	99	98	97	95	93	51.8	28.2	15.4	2676	1461	0.98	1.536	1.539	23.2	22.9	2.0	Skd	-	CH
R08/0327	Pothole 1 Section 4	16.983	1.1m R of CL	-	(100)	(99)	(94)	(84)	(73)	(65)	(63)	(50)	(40)	(30.8)	(8.4)	(4.2)	(418)	(209)	(0.80)	(1.907)	(1.907)	(11.4)	(11.4)	(10.5)	(Skd)	-	(GM-GC)
					Material not tested; visually assessed as being the same as section 4 pothole 2 subgrade, Article no. R08/0330.																						
R08/0330	Pothole 2 Section 4	17.270	1.1m R of CL	-	100	99	94	84	73	65	63	50	40	30.8	8.4	4.2	418	209	0.80	1.907	1.907	11.4	11.4	10.5	Skd	-	GM-GC
R08/0332	Pothole 1 Section 5	17.803	1.1m R of CL	-	-	100	95	80	66	57	50	39	31	32.2	8.8	3.2	341	124	0.80	1.973	1.982	10.5	10.0	28	Skd	-	GM
R08/0335	Pothole 2 Section 5	18.195	1.1m R of CL	-	100	98	94	86	71	62	58	50	43	32.6	8.6	4.4	433	221	0.85	1.943	1.938	10.5	10.8	17	Skd	-	GM-GC
R08/0339	Pothole 1 Section 6	18.900	1.1m R of CL	-	-	100	99	92	83	76	68	62	55	32.4	7.0	2.6	433	161	0.88	1.814	1.818	15.7	15.4	11	Skd	-	CL
R08/0343	Pothole 2 Section 6	19.700	1.1m R of CL	-	100	99	93	81	73	64	56	45	37	31.6	9.2	3.8	417	172	0.82	1.910	1.919	11.2	10.7	17	Skd	-	GC

Table A2-5 **Summary of Testing - Subgrade Material Moisture and CBR**

Location					Insitu CBR and Field MC			Laboratory CBR						D900 CBR	USC
Article No.	Trench/ Pothole	Dist. (km)	Location	Thickness (mm)	MC	% of OMC	CBR (Depth)[1]	MDD	Comp DD	OMC	Comp MC	CBR	Cond		
R08/0305	Pothole 1 Section 1	4.726	RHS	NA	11.8	53	50(50-60), 23(60-120), 11(120-201), 27(201-218), >60(218-285)	(1.548)	(1.551)	(22.3)	(22.1)	(2.0)	(Skd)	-	(CH)
R08/0309	Pothole 1 Section 2	6.822	RHS	NA	26.6	119	5.0(50-195), 4.0(195-711)	1.548	1.551	22.3	22.1	2.0	Skd	-	CH
R08/0313	Pothole 2 Section 2	7.526	RHS	NA	35.4	148	1.5(50-238), 3.5(238-429), 6.5(429-554), 7.5(554-701)	1.495	1.498	23.8	23.6	1.0	Skd	-	CH
R08/0318	Trench 1 Section 3	10.372	1.8m R of CL	NA	31.3	123	6.5(50-214), 11(214-305), 7.5(305-396), 5.5(396-489), 5.0(489-711)	1.492	1.489	25.4	25.7	3.5	Skd	-	CI
R08/0324	Pothole 1 Section 3	11.158	RHS	NA	28.5	123	2.5(50-234), 7.0(234-375), 11(375-574), 15(574-710)	1.536	1.539	23.2	22.9	2.0	Skd	-	CH
R08/0327	Pothole 1 Section 4	16.983	RHS	NA	11.8	104	24(50-102), >60(102-173), 34(173-199), >60(199-330)	(1.907)	(1.907)	(11.4)	(11.4)	(10.5)	(Skd)	-	(GM-GC)
R08/0330	Pothole 2 Section 4	17.270	RHS	NA	7.5	65	34(50-115), 24(115-238), 38(238-331), 22(331-418), 9.5(418-562), 8.0(562-700)	1.907	1.907	11.4	11.4	10.5	Skd	-	GM-GC
R08/0332	Pothole 1 Section 5	17.803	RHS	NA	4.9	47	36(50-111), 42(111-244), 60(244-267), 29(267-331), 42(331-449), 24(449-700)	1.973	1.982	10.5	10.0	28	Skd	-	GM
R08/0335	Pothole 2 Section 5	18.195	RHS	NA	15.8	150	22(50-237), 10.0(237-385), 16(385-700)	1.943	1.938	10.5	10.8	17	Skd	-	GM-GC
R08/0339	Pothole 1 Section 6	18.900	RHS	NA	10.7	68	10.0(50-237), 6.0(237-443), 2.5(443-736)	1.814	1.818	15.7	15.4	11	Skd	-	CL
R08/0343	Pothole 2 Section 6	19.700	RHS	NA	16.3	146	9.5(50-176), 58(176-241), >60(241-327), 54(327-428), 28(428-625), 15(625-700)	1.910	1.919	11.2	10.7	17	Skd	-	GC

Note11.2 1: CBR depths (mm) are 50mm below subgrade level

Table A2-6 **Summary of Testing - Base Material Moistures**

Location					Field MC	Laboratory CBR							USC
Article No.	Trench/ Pothole	Dist. (km)	Location	Thickness (mm)	MC	% of OMC	MDD	Comp DD	OMC	Comp MC	CBR	Cond	
R08/0302	Pothole 1 Section 1	4.726	RHS	220	8.1	76	2.004	2.009	10.6	10.3	46	Skd	GM
R08/0306	Pothole 1 Section 2	6.822	RHS	210	6.3	61	1.997	1.997	10.4	10.4	36	Skd	GM
R08/0310	Pothole 2 Section 2	7.526	RHS	290	4.8	60	2.162	2.166	8.0	7.8	21	Skd	GC
R08/0315	Trench 1 Section 3	10.372	1.8m R of CL	See Appendix 8	5.0	63	2.132	2.134	8.0	7.9	60	Skd	SC
R08/0322	Pothole 1 Section 3	11.158	RHS	320	4.9	63	2.168	2.168	7.8	7.8	34	Skd	GC
R08/0325	Pothole 1 Section 4	16.983	RHS	120	9.1	96	(2.094)	(2.091)	(9.5)	(9.7)	(30)	(Skd)	(GC)
R08/0328	Pothole 2 Section 4	17.270	RHS	210	7.3	86	2.103	2.099	8.5	8.7	44	Skd	GC
R08/0331	Pothole 1 Section 5	17.803	RHS	360	5.8	61	(2.094)	(2.091)	(9.5)	(9.7)	(30)	(Skd)	(GC)
R08/0333	Pothole 2 Section 5	18.195	RHS	310	6.5	68	2.094	2.091	9.5	9.7	30	Skd	GC
R08/0337	Pothole 1 Section 6	18.900	RHS	390	6.2	89	2.161	2.157	7.0	7.2	92	Skd	GC
R08/0340	Pothole 2 Section 6	19.700	RHS	200	7.6	81	2.093	2.092	9.4	9.4	44	Skd	GC

Appendix 3

Sampling Log

Table A3-1 Sampling Log						
Location				**Material description (See note below)**	**Article No's**	**Test**
Trench/ Pothole	**Distance (km)**	**Location**	**Thickness (mm)**			
Section 1 Pothole 1	4.726	1.1m R of CL	30	**Seal**	-	-
			220	**Base:** GM – Silty Sandy Gravel, light brown, medium plasticity medium-fine grained gravel with traces of coarser gravels, poorly graded, dry.	R08/0302	Grading, LL, PI, LS, MC, 1pt CBR and UCS
			30	**Seal**	-	-
			200	**Base:** (SC) – Clayey Gravelly Sand, light brown, low plasticity, poorly graded clayey sand, medium-fine grained gravel with traces of coarse gravel, moist.	R08/0303	Material not tested; visually assessed as being the same as section 2 pothole 2 subbase, Article no. R08/0311.
				Subgrade: (CH) – Organic Clay, yellow, high plasticity silty clay with traces of sand and fine gravels, moist.	R08/0305	Material not tested; visually assessed as being the same as section 2 pothole 1 subgrade, Article no. R08/0309.
Section 2 Pothole 1	6.822	1.1m R of CL	30	**Seal**	-	-
			210	**Base:** (GM) – Silty Sandy Gravel, light brown, low plasticity silty sandy medium grained gravel with coarse and fine gravels, poorly graded, moist.	R08/0306	Grading, LL, PI, LS, MC, 1pt CBR and UCS
				Subgrade: CH – Organic Clay, grey, high plasticity silty clay with traces of sand and fine gravels, moist.	R08/0309	Grading, LL, PI, LS, 1pt CBR, MC and DCP
Section 2 Pothole 2	7.526	1.1m R of CL	30	**Seal**	-	-
			290	**Base:** GC – Silty Sandy Gravel, dark brown, low plasticity, poorly graded sandy medium-coarse gravels with fine gravels, moist.	R08/0310	Grading, LL, PI, LS, MC, 1pt CBR and UCS
			100	**Subbase:** SC – Clayey Gravelly Sand, light brown, low plasticity, poorly graded clayey sand, medium-fine grained gravel with traces of coarse gravel, moist.	R08/0311	Grading, LL, PI, LS and 1pt CBR
			30	**Seal**	-	-
			120	**Base:** (GC) – Clayey Sandy Gravel, dark brown, low plasticity, poorly graded silty sandy medium gravel with fine and coarse gravels, moist.	R08/0312	Material not tested; visually assessed as being the same as section 4 pothole 2 base, Article no. R08/0328.
				Subgrade: CH – Inorganic Clay, light brown, high plasticity silty clay with traces of sand and gravel, moist.	R08/0313	Grading, LL, PI, LS, 1pt CBR, MC and DCP
Section 3 Pothole 1	11.158	1.1m R of CL	30	**Seal**	-	-
			320	**Base:** GC – Clayey Sandy Gravel, dark brown, low plasticity, poorly graded silty sandy medium gravel with fine and coarse gravels, moist.	R08/0322	Grading, LL, PI, LS, MC, 1pt CBR and UCS
				Subgrade: CH – Inorganic Clay, black, high plasticity silty clay with traces of sand and fine gravels, moist.	R08/0324	Grading, LL, PI, LS, 1pt CBR, MC and DCP
Section 3 Trench 1	10.372	1.4-3.2m R of CL	See Appendix 8	**Seal**	-	-
				Base: SC – Clayey Sandy Gravel/ Gravelly Sandy, dark brown, low plasticity medium-coarse grained clayey gravel with fine gravel, poorly graded, moist.	R08/0315	Grading, LL, PI, LS, MC, 1pt CBR and UCS
				Subbase: (GC) – Clayey Sandy Gravel, dark brown, low plasticity, poorly graded silty sandy medium gravel with fine and coarse gravels, moist.	R08/0317	Material not tested; visually assessed as being the same as section 4 pothole 2 base, Article no. R08/0328.
				Subgrade: CI – Inorganic Clay, black, medium plasticity with traces of sand and fine grained gravel, moist.	R08/0318	Grading, LL, PI, LS, 1pt CBR, MC and DCP

Table A3-1 Sampling Log						
Location				Material description (See note below)	Article No's	Test
Trench/ Pothole	Distance (km)	Location	Thickness (mm)			
Section 4 Pothole 1	16.983	1.1m R of CL	30	**Seal**	-	-
			120	**Base:** (GC) – Clayey Sandy Gravel, dark brown, low plasticity, medium-fine grained gravel with fine gravel, poorly graded, moist.	R08/0325	Material not tested; visually assessed as being the same as section 5 pothole 2 base, Article no. R08/0333.
			100	**Subbase:** (SC) – Clayey Gravelly Sand, light brown, low plasticity, poorly graded clayey sand, medium-fine grained gravel with traces of coarse gravel, moist.	R08/0326	Material not tested; visually assessed as being the same as section 2 pothole 2 subbase, Article no. R08/0311.
				Subgrade: (GM-GC) – Sandy Clayey Gravel/ Gravelly Clay, light brown, low plasticity, poorly graded medium-coarse clayey gravel with traces of fine gravel and cobbles, moist.	R08/0327	Material not tested; visually assessed as being the same as section 4 pothole 2 subgrade, Article no. R08/0330.
Section 4 Pothole 2	17.270	1.1m R of CL	30	**Seal**	-	-
			210	**Base:** GC – Clayey Sandy Gravel, dark brown, low plasticity, poorly graded silty sandy medium gravel with fine and coarse gravels, moist.	R08/0328	Grading, LL, PI, LS, MC, 1pt CBR and UCS
			30	**Seal**	-	
				Subgrade: GM-GC – Sandy Clayey Gravel/ Gravelly Clay, light brown, low plasticity, poorly graded medium-coarse clayey gravel with traces of fine gravel and cobbles, moist.	R08/0330	Grading, LL, PI, LS, 1pt CBR, MC and DCP
Section 5 Pothole 1	17.803	1.1m R of CL	30	**Seal**	-	-
			360	**Base:** (GC) – Clayey Sandy Gravel, dark brown, low plasticity, medium-fine grained gravel with fine gravel, poorly graded, moist.	R08/0331	Material not tested; visually assessed as being the same as section 5 pothole 2 base, Article no. R08/0333.
				Subgrade: GM – Sandy Silty Gravel, light brown, low plasticity, poorly graded medium-coarse gravels with fine gravel, moist.	R08/0332	Grading, LL, PI, LS, 1pt CBR, MC and DCP
Section 5 Pothole 2	18.195	1.1m R of CL	30	**Seal**	-	-
			310	**Base:** GC – Clayey Sandy Gravel, dark brown, low plasticity, medium-fine grained gravel with fine gravel, poorly graded, moist.	R08/0333	Grading, LL, PI, LS, MC, 1pt CBR and UCS
			30	**Seal**	-	-
			290	**Base:** (GC) – Clayey Sandy Gravel, dark brown, low plasticity, medium-fine grained gravel with fine gravel, poorly graded, moist.	R08/0336	Material not tested; visually assessed as being the same as section 5 pothole 2 base, Article no. R08/0333.
				Subgrade: GM-GC – Sandy Clayey Gravel/ Gravelly Clay, light brown, low plasticity, poorly graded medium-coarse clayey gravel with traces of fine gravel and cobbles, moist.	R08/0335	Grading, LL, PI, LS, 1pt CBR, MC and DCP
Section 6 Pothole 1	18.900	1.1m R of CL	30	**Seal**	-	-
			390	**Base:** GC – Clayey Sandy Gravel, mottled red/ brown, low plasticity, poorly graded silty sandy medium gravel with fine and coarse gravels, moist.	R08/0337	Grading, LL, PI, LS, MC, 1pt CBR and UCS
				Subgrade: CL – Inorganic Gravelly Clay, mottled brown/ orange, low plasticity sandy clayey medium gravel with fine and coarse gravels, moist.	R08/0339	Grading, LL, PI, LS, 1pt CBR, MC and DCP

Table A3-1 Sampling Log						
Location				Material description (See note below)	Article No's	Test
Trench/ Pothole	Distance (km)	Location	Thickness (mm)			
Section 6 Pothole 2	19.700	1.1m R of CL	30	**Seal**	-	-
			200	**Base:** GC, Clayey Sandy Gravel, light brown, low plasticity poorly graded medium-coarse gravels with fine gravels and traces of cobbles, moist.	R08/0340	Grading, LL, PI, LS, MC, 1pt CBR and UCS
			50	**Seal**	-	-
			50	**Base:** (GC), Clayey Sandy Gravel, light brown, low plasticity poorly graded medium-coarse gravels with fine gravels and traces of cobbles, moist.	R08/0342	Material not tested; visually assessed as being the same as section 6 pothole 2 base, Article no. R08/0340.
				Subgrade: GC, Sandy Clayey Gravel, mottled red/ grey, low plasticity poorly graded medium-coarse grained gravel with fine gravel, moist.	R08/0343	Grading, LL, PI, LS, 1pt CBR, MC and DCP

Table A3-2 Sampling Log - Legend		
Method No	**Method description**	**Abbreviation**
Q102A	Moisture content (oven dried)	MC
Q103A	Particle size distribution (wet sieving)	Grading
Q103C	Particle size distribution (hydrometer)	Hydrometer
Q104D	Liquid limit (one point)	LL
Q105	Plastic limit, Plasticity index	PI
Q106	Linear Shrinkage	LS
Q110A	Moisture/Density relationship (standard compaction)	MDR
Q110C	Moisture/Density relationship (standard compaction) with additive	MDRC
Q113A	California Bearing ratio 100% std unsoaked	CBR
Q113C	California Bearing ratio at nominated levels of dry density and moisture content	1pt CBR
Q114B	Insitu CBR using DCP	DCP
Q115	Unconfined compressive strength	UCS
Q133	Lime demand	Lime demand
AS 1289.1.2.1 cl 6.5.1	Disturbed sampling - hand excavated pit or trench	-
AS 1289.1.2.1 cl 6.5.4	Disturbed sampling - machine excavated pit or trench	-

Table A3-3 USC Symbols - Legend		
Group Symbol	**Typical Group Names**	**Field identification (Sand and gravels)**
GW	Well graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	Predominately one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength
GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength
GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength
SW	Well graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength
SP	Poorly graded sands and gravelly sands, little or no fines, uniform sands	Predominately one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength
SM	Silty sands, sand silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength
SC	Clayey sands, sand clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	-
CL, CI	Inorganic clays, of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	-
OL	Organic silts and organic silty clays of low plasticity	-
MH	Inorganic silts, micaccous or diatomaceous fine sandy or silty soils, classic silts	-
CH	Inorganic clays of high plasticity, fat clays	-
OH	Organic clays of medium to high plasticity, organic silts	-
Pt	Peat and other highly organic soils	-

Appendix 4

In situ CBR (DCP) Reports

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

REPORT on INSITU CBR (D.C.P.)

Client	PD & D Rockhampton
Charge no	54/41F/507
Sampling Method	See Remarks
Date sampled	07/03/08
Sampled by	This Laboratory
Sender's no	Section1
Material source	As Per Location
Sample location	Ch. 4.726km, 1.1m R of CL
Sample no	R08/0305

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GM-SILTY SANDY GRAVEL	220	8.1	R08/0302			
SEAL	30	----	----			
(SC)-CLAYEY GRAVELLY SAND	200	----	----			
		SUBGRADE				
						50 MM
				10	50	60 MM
				60	23	
						120 MM
(CH)-ORGANIC CLAY	---	11.8	R08/0305	81	11	
						201 MM
				17	27	218 MM
				67	>60	
						285 MM

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29325 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

Accreditation Number: 2360
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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 07/03/08
Sampled by This Laboratory
Sender's no Section2
Material source As Per Location
Sample location Ch. 6.822km, 1.1m R of CL
Sample no R08/0309

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
(GM)-SILTY SANDY GRAVEL	210	6.3	R08/0306			
	SUBGRADE					50 HH
				145	5.0	
						195 HH
CH-ORGANIC CLAY	---	26.6	R08/0309			
				516	4.0	
						711 HH

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29326 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

Accreditation Number: 2360
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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 07/03/08
Sampled by This Laboratory
Sender's no Section2
Material source As Per Location
Sample location Ch. 7.526km, 1.1m R of CL
Sample no R08/0313

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GC-SILTY SANDY GRAVEL	290	4.8	R08/0310			
SC-CLAYEY GRAVELLY SAND	100	----	----			
SEAL	30	----	----			
		SUBGRADE				50 mm
				188	1.5	
						238 mm
CH-INORGANIC CLAY	---	35.4	R08/0313	191	3.5	
						429 mm
				125	6.5	
						554 mm
				147	7.5	
						701 mm

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29327 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 07/03/08
Sampled by This Laboratory
Sender's no Section3
Material source As Per Location
Sample location Ch. 11.158km, 1.1m R of CL
Sample no R08/0324

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GC-CLAYEY SANDY GRAVEL	320	4.9	R08/0322			
		SUBGRADE				50 HH
				184	2.5	
						234 HH
				141	7.0	
CH-INORGANIC CLAY	---	28.5	R08/0324			375 HH
				199	11	
						574 HH
				136	15	
						710 HH

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29328 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

REPORT on INSITU CBR (D.C.P.)

Client: PD & D Rockhampton

Charge no: 54/41F/507
Sampling Method: See Remarks
Date sampled: 07/03/08
Sampled by: This Laboratory
Sender's no: Section3
Material source: As Per Location
Sample location: Ch. 10.372km, 1.8m R of CL
Sample no: R08/0318

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	40	----	----			
SC-CLAYEY SANDY GRAVEL	140	5.0	R08/0315			
(GC)-CLAYEY SANDY GRAVEL	320	----	----			
	SUBGRADE					50 MM
				164	6.5	
						214 MM
				91	11	
						305 MM
CI-INORGANIC CLAY	---	31.3	R08/0318	91	7.5	
						396 MM
				93	5.5	
						489 MM
				222	5.0	
						711 MM

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29329 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

REPORT on INSITU CBR (D.C.P.)

Client: PD & D Rockhampton

Charge no: 54/41F/507
Sampling Method: See Remarks
Date sampled: 07/03/08
Sampled by: This Laboratory
Sender's no: Section4
Material source: As Per Location
Sample location: Ch. 16.983km, 1.1m R of CL
Sample no: R08/0327

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
(GC)-CLAYEY SANDY GRAVEL	120	9.1	R08/0325			
(SC)-CLAYEY GRAVELLY SAND	100	----	----			
		SUBGRADE				
						50 MM
				52	24	
						102 MM
				71	>60	
(GM-GC)-SANDY CLAYEY GRAVEL	---	11.8	R08/0327			173 MM
				26	34	199 MM
				131	>60	
						330 MM

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29330 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

REPORT on INSITU CBR (D.C.P.)

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 07/03/08
Sampled by This Laboratory
Sender's no Section4
Material source As Per Location
Sample location Ch. 17.270km, 1.1m R of CL
Sample no R08/0330

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GC-CLAYEY SANDY GRAVEL	210	7.3	R08/0328			
SEAL	30	----	----			
	SUBGRADE					
				65	34	50 mm
				123	24	115 mm
				93	38	238 mm
				87	22	331 mm
				144	9.5	418 mm
				138	8.0	562 mm
GM-GC-SANDY CLAYEY GRAVEL	---	7.5	R08/0330			700 mm

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29331 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 06/03/08
Sampled by This Laboratory
Sender's no Section5
Material source As Per Location
Sample location Ch. 17.803km, 1.1m R of CL
Sample no R08/0332

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
(GC)-CLAYEY SANDY GRAVEL	360	5.8	R08/0331			
		SUBGRADE				50 HH
				61	36	111 HH
				133	42	244 HH
				23	60	267 HH
GM-SANDY SILTY GRAVEL	---	4.9	R08/0332	64	29	331 HH
				118	42	449 HH
				251	24	700 HH

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29332 Date 29/04/08 Signatory NR
M.J. Wilson

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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 06/03/08
Sampled by This Laboratory
Sender's no Section5
Material source As Per Location
Sample location Ch. 18.195km, 1.1m R of CL
Sample no R08/0335

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GC-CLAYEY SANDY GRAVEL	310	6.5	R08/0333			
SEAL	30	----	----			
(GC)-CLAYEY SANDY GRAVEL	290	----	----			
	SUBGRADE					50 mm
				187	22	
						237 mm
				148	10.0	
GM-GC-SANDY CLAYEY GRAVEL	---	15.8	R08/0335			385 mm
				315	16	
						700 mm

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29333 Date 29/04/08 Signatory NR
M.J. Wilson

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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 06/03/08
Sampled by This Laboratory
Sender's no Section6
Material source As Per Location
Sample location Ch. 18.900km, 1.1m R of CL
Sample no R08/0339

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GC-CLAYEY SANDY GRAVEL	390	6.2	R08/0337			
		SUBGRADE				50 HH
				187	10.0	
						237 HH
CL-INORGANIC GRAVELLY CLAY	---	10.7	R08/0339	206	6.0	
						443 HH
				293	2.5	
						736 HH

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29334 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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REPORT
on
INSITU CBR (D.C.P.)

Queensland Government
Department of Main Roads

216 Richardson Road
North Rockhampton
QLD 4701

Client PD & D Rockhampton

Charge no 54/41F/507
Sampling Method See Remarks
Date sampled 06/03/08
Sampled by This Laboratory
Sender's no Section6
Material source As Per Location
Sample location Ch. 19.700km, 1.1m R of CL
Sample no R08/0343

DETAILS OF PAVEMENT/SUBGRADE MATERIALS				CBR TEST RESULTS (Q114B-1978)		
DESCRIPTION	THICKNESS	M.C.(%)	SAMPLE No	THICKNESS	CBR VALUE	DEPTH
SEAL	30	----	----			
GC-CLAYEY SANDY GRAVEL	200	7.6	R08/0340			
SEAL	50	----	----			
(GC)-CLAYEY SANDY GRAVEL	50	----	----			
	SUBGRADE					50 MM
				126	9.5	
						176 MM
				65	58	241 MM
				86	>60	
GC-SANDY CLAYEY GRAVEL	---	16.3	R08/0343			327 MM
				101	54	428 MM
				197	28	
						625 MM
				75	15	700 MM

Remark(s) Sampling Method AS1289.1.2.1 cl.6.5.4 used.

Moisture Content Method Q102A-1993 used.

Checked by NR
M.J. Wilson

Report no 29335 Date 29/04/08 Signatory NR
M.J. Wilson

Software version 4.2

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Appendix 5

Pavement Results (Including UCS Results)

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 420

Mat Source : AS PER LOCATION
Item Desc. : Base

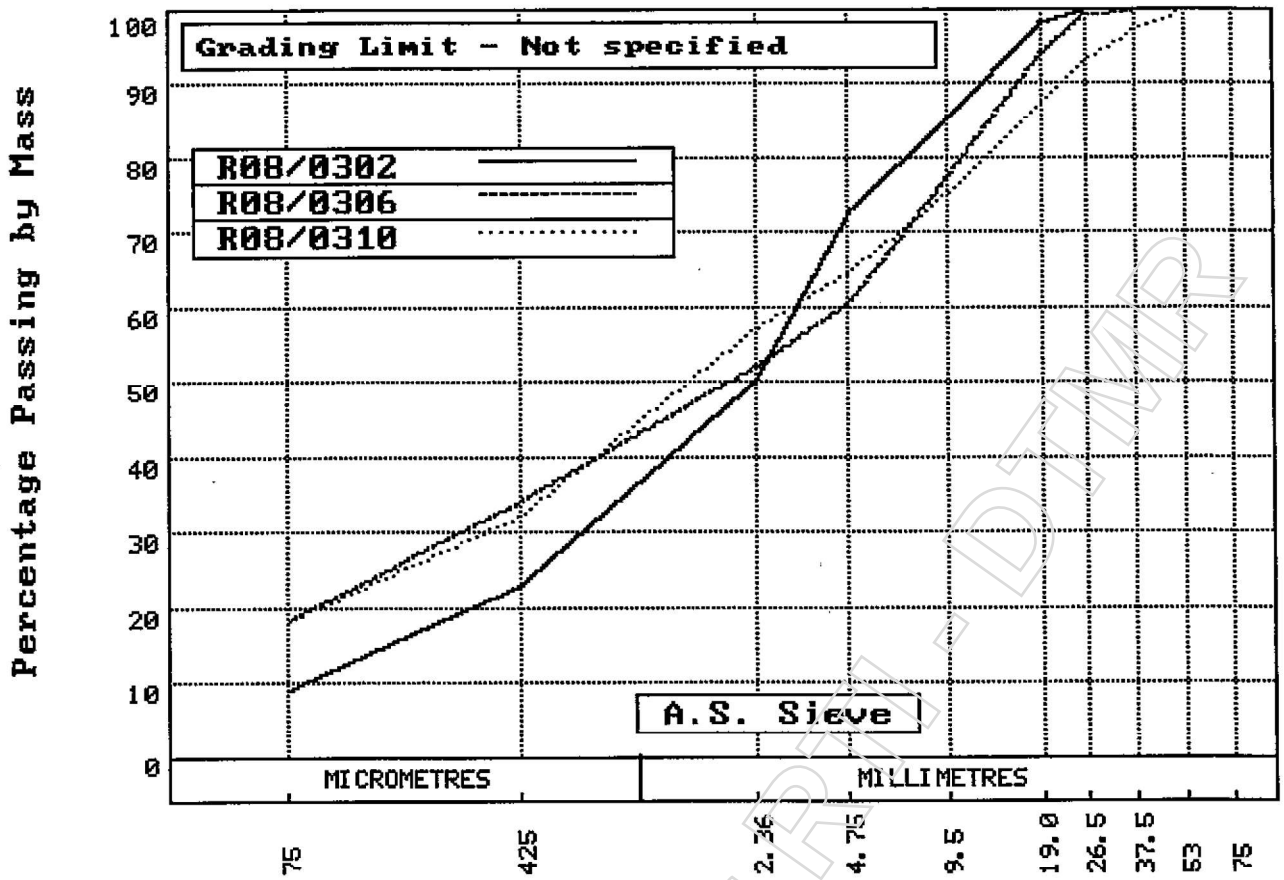
Lab Number	R08/0302	R08/0306	R08/0310
Senders Number			
Lot Number			
Chainage	CH. 4.726km	CH. 6.822km	CH. 7.526km
Sample Location	1.1m R of CL	RHS	RHS
Layer	-	-	-
Depth	-	-	-
Sampled By	THIS LABORATORY	THIS LABORATORY	THIS LABORATORY
Samp. Method	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4
Date Sampled	07/03/08	07/03/08	07/03/08
Date Tested	14/03/08	17/03/08	17/03/08

A.S. Sieve Size	Percentage passing by mass (Q103A) Lab number R08/0302	R08/0306	R08/0310
75.0 mm			
53.0 mm			100
37.5 mm		100	97
26.5 mm	100	99	93
19.0 mm	98	94	87
9.5 mm	85	77	75
4.75 mm	73	61	65
2.36 mm	50	52	57
.425 mm	23	34	32
.075 mm	8.9	18	18

Tests	Results		
L.L. (Q104A/D)	35.2	30.4	25.2
P.I. (Q105)	6.6	6.2	8.4
L.S. (Q106)	4.2	4.0	5.2
M.A.L. (Q107)	-	-	-
P.I.* % < 0.425mm	152	210	270
L.S.* % < 0.425mm	97	135	167
Ratio 0.075/0.425	0.39	0.55	0.57

Remarks : R08/0302 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0306 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0310 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Signatory : NR
W.A.Daniels



NR

NR

Checked By : W.A.Daniels

Signatory : W.A.Daniels

Page: 2 of 2 Report No : 29232 Date : 23/04/08 CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 421

Mat Source : AS PER LOCATION
Item Desc. : Subbase

Lab Number	R08/0311		
Senders Number			
Lot Number			
Chainage	CH. 7.526km		
Sample Location	RHS		
Layer	-		
Depth	-		
Sampled By	THIS LABORATORY		
Samp. Method	AS1289.1.2.1 cl 6.5.4		
Date Sampled	07/03/08	/ /	/ /
Date Tested	17/03/08	/ /	/ /

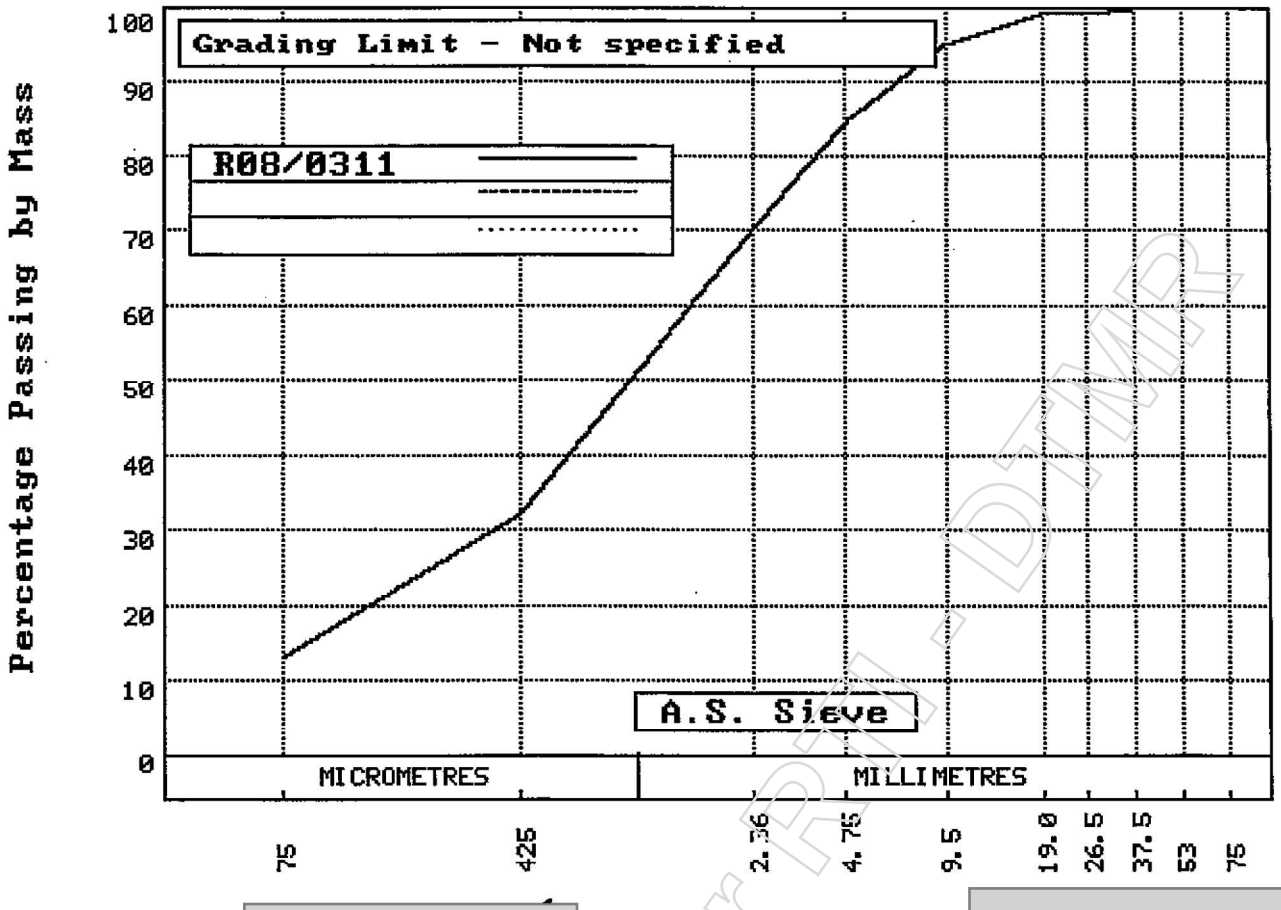
A.S. Sieve Size	Percentage passing by mass (Q103A) Lab number R08/0311		
75.0 mm			
53.0 mm			
37.5 mm	100		
26.5 mm	99		
19.0 mm	99		
9.5 mm	95		
4.75 mm	85		
2.36 mm	70		
.425 mm	32		
.075 mm	13		

Tests	Results		
L.L. (Q104A/D)	28.2		
P.I. (Q105)	8.2		
L.S. (Q106)	4.0		
M.A.L. (Q107)	-		
P.I.* % < 0.425mm	264		
L.S.* % < 0.425mm	129		
Ratio 0.075/0.425	0.41		

Remarks : R08/0311 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
-
-

NR

Signatory : W.A.Daniels



Checked By : W.A.Daniels	NR	Signatory : W.A.Daniels	NR
Page: 2 of 2	**Report No : 29231**	Date : 23/04/08	CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 420

Mat Source : AS PER LOCATION
Item Desc. : Base

Lab Number	R08/0315	R08/0322	R08/0328
Senders Number			
Lot Number			
Chainage	CH. 10.372km	CH. 11.158km	CH. 17.270km
Sample Location	1.8m R of CL OWP	RHS	RHS
Layer	-	-	-
Depth	-	-	-
Sampled By	THIS LABORATORY	THIS LABORATORY	THIS LABORATORY
Samp. Method	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4
Date Sampled	07/03/08	07/03/08	07/03/08
Date Tested	13/03/08	14/03/08	13/03/08

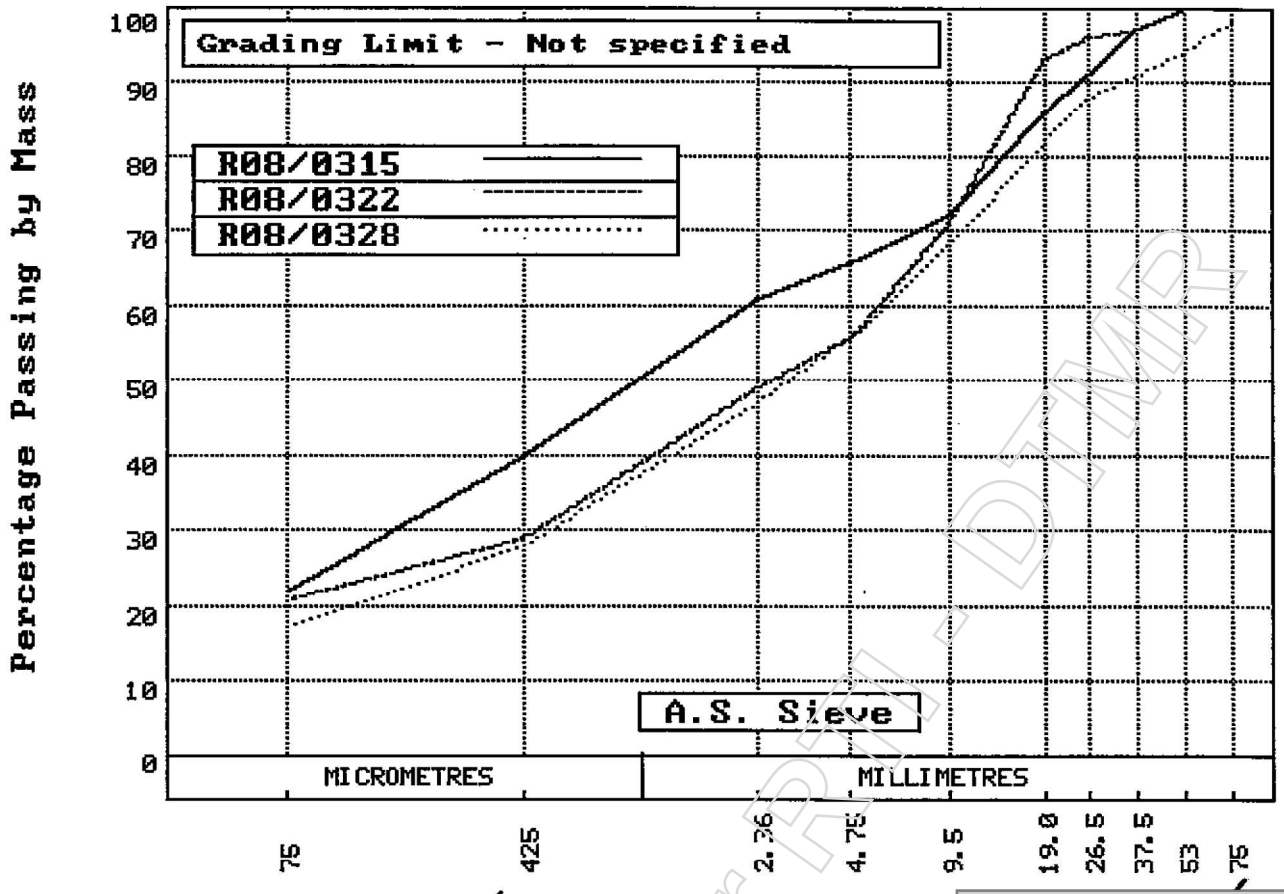
A.S. Sieve Size	Percentage passing by mass (Q103A) Lab number R08/0315	R08/0322	R08/0328
75.0 mm			98
53.0 mm	100	100	94
37.5 mm	97	97	91
26.5 mm	91	96	88
19.0 mm	86	93	82
9.5 mm	72	71	68
4.75 mm	66	56	56
2.36 mm	61	49	47
.425 mm	40	29	28
.075 mm	22	21	17

Tests	Results		
L.L. (Q104A/D)	23.6	27.2	24.8
P.I. (Q105)	7.6	9.4	8.0
L.S. (Q106)	5.0	5.2	4.8
M.A.L. (Q107)	-	-	-
P.I.* % < 0.425mm	303	272	222
L.S.* % < 0.425mm	200	150	133
Ratio 0.075/0.425	0.54	0.72	0.62

Remarks : R08/0315 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0322 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0328 - CLIENT-MANAGER (PD&D) ROCKHAMPTON

NR

Signatory :
W.A.Daniels



Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page: 2 of 2 **Report No : 29233** Date : 23/04/08 CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 420

Mat Source : AS PER LOCATION
Item Desc. : Base

Lab Number	R08/0333	R08/0337	R08/0340
Senders Number			
Lot Number			
Chainage	CH. 18.195km	CH. 18.900km	CH. 19.700km
Sample Location	RHS	RHS	RHS
Layer	-	-	-
Depth	-	-	-
Sampled By	THIS LABORATORY	THIS LABORATORY	THIS LABORATORY
Samp. Method	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4
Date Sampled	06/03/08	06/03/08	06/03/08
Date Tested	13/03/08	13/03/08	14/03/08

Percentage passing by mass (Q103A)

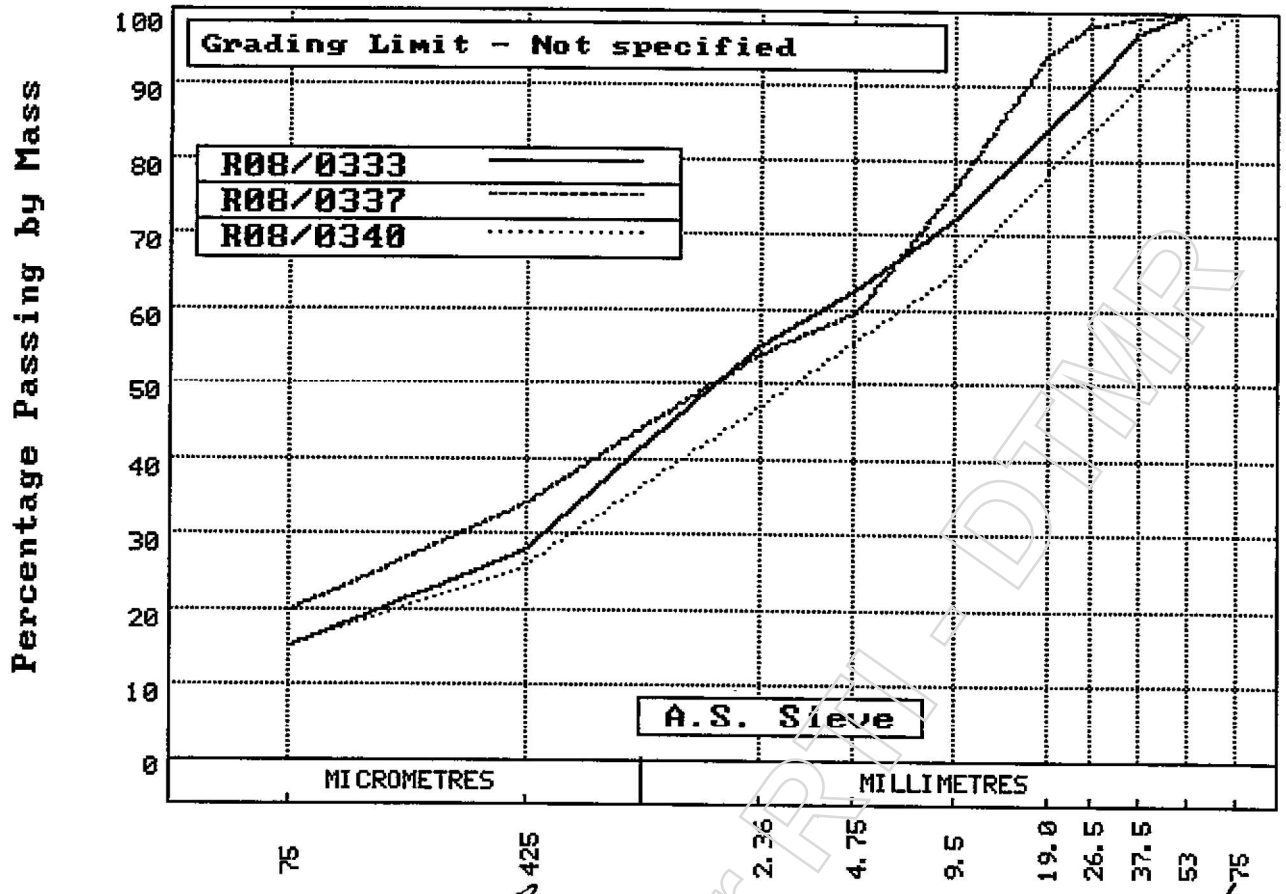
A.S. Sieve Size	Lab number R08/0333	R08/0337	R08/0340
75.0 mm			100
53.0 mm	100	100	96
37.5 mm	97	99	90
26.5 mm	90	98	84
19.0 mm	84	94	78
9.5 mm	72	76	65
4.75 mm	63	60	56
2.36 mm	55	54	47
.425 mm	28	34	26
.075 mm	15	20	15

Tests	Results		
L.L. (Q104A/D)	26.4	25.2	28.5
P.I. (Q105)	8.0	8.8	8.2
L.S. (Q106)	5.8	5.6	5.4
M.A.L. (Q107)	-	-	-
P.I.* % < 0.425mm	222	0	211
L.S.* % < 0.425mm	161	193	139
Ratio 0.075/0.425	0.54	0.59	0.60

Remarks : R08/0333 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0337 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0340 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON

NR

Signatory : W.A.Daniels



Checked By : W.A.Daniels		Signatory : W.A.Daniels	
Page: 2 of 2	Report No : 29234	Date : 23/04/08	CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0302
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 4.726km
Sample Loc.: 1.1m R of CL
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0302
MDD (t/m3)	2.004
OMC (%)	10.6
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.004
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	10.6
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.009
Achieved % MDD	(%)	100.2
Achieved Moist. Cont.	(%)	10.3
Achieved % OMC	(%)	97

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	27
CBR 5.0 mm	46

Swell	(%)	0.8

Material CBR Value at achieved DD and MC	46

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29102 Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0306
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 6.822km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0306
MDD (t/m3)	1.997
OMC (%)	10.4
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.997
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	10.4
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.997
Achieved % MDD	(%)	100.0
Achieved Moist. Cont.	(%)	10.4
Achieved % OMC	(%)	100

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	25
CBR 5.0 mm	36

Swell	(%)	-0.2

Material CBR Value at achieved DD and MC	36

Remarks : - CLIENT MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29103** Date : 08/04/08 CF/0892/S37

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Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0310
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 7.526km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details		
Sample Number		R08/0310
MDD	(t/m3)	2.162
OMC	(%)	8.0
MDR Test Method		Q110A-1996

Nominated Dry Density	(t/m3)	2.162
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	8.0
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.166
Achieved % MDD	(%)	100.2
Achieved Moist. Cont.	(%)	7.8
Achieved % OMC	(%)	98

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	11
CBR 5.0 mm	21

Swell	(%)	-0.1

Material CBR Value at achieved DD and MC	21

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29104** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads Materials Services Rockhampton	Rockhampton Laboratory 216 Richardson Road North Rockhampton Qld	**REPORT ON SINGLE POINT CBR**

Lab Number : R08/0340
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 15/03/08

Lot number :
Chainage : CH. 19.700km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0340
MDD (t/m3)	2.093
OMC (%)	9.4
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.093
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	9.4
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.092
Achieved % MDD	(%)	100.0
Achieved Moist. Cont.	(%)	9.4
Achieved % OMC	(%)	100

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	29
CBR 5.0 mm	44

Swell	(%)	0.4

Material CBR Value at achieved DD and MC	44

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : NR A.Williamson

Page : 1 of 1 **Report No :** 29262 Date : 24/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0328
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 15/03/08

Lot number :
Chainage : CH. 17.270km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998

Test Condition	Soaked

MDR Details	
Sample Number	R08/0328
MDD (t/m3)	2.103
OMC (%)	8.5
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.103
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	8.5
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.099
Achieved % MDD	(%)	99.8
Achieved Moist. Cont.	(%)	8.7
Achieved % OMC	(%)	102

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	38
CBR 5.0 mm	44

Swell	(%)	0.2

Material CBR Value at achieved DD and MC	44

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : NR A.Williamson

Page : 1 of 1 **Report No : 29264** Date : 24/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0333
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 15/03/08

Lot number :
Chainage : CH. 18.195km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998

Test Condition	Soaked

MDR Details	
Sample Number	R08/0333
MDD (t/m3)	2.094
OMC (%)	9.5
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.094
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	9.5
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	20.91
Achieved % MDD	(%)	99.9
Achieved Moist. Cont.	(%)	9.7
Achieved % OMC	(%)	102

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	16
CBR 5.0 mm	30

Swell	(%)	0.2

Material CBR Value at achieved DD and MC	30

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : NR A.Williamson

Page : 1 of 1 **Report No : 29265** Date : 24/04/08 CF/0892/S37

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Qld Dept. of Main Roads Materials Services Rockhampton Laboratory	Rockhampton Laboratory 216 Richardson Road North Rockhampton Qld	**REPORT ON SINGLE POINT CBR**

Lab Number : R08/0311
Job Number : 54/41F/507
Item number : 421
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 7.526km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subbase

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0311
MDD (t/m3)	2.152
OMC (%)	8.0
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.152
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	8.0
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.156
Achieved % MDD	(%)	100.2
Achieved Moist. Cont.	(%)	7.8
Achieved % OMC	(%)	98

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	72
CBR 5.0 mm	80

Swell	(%)	0.0

Material CBR Value at achieved DD and MC	80

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29105** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0315
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 17/03/08

Lot number :
Chainage : CH. 10.372km
Sample Loc.: 1.8m R of CL OWP
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0315
MDD (t/m3)	2.132
OMC (%)	8.0
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.132
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	8.0
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.134
Achieved % MDD	(%)	100.1
Achieved Moist. Cont.	(%)	7.9
Achieved % OMC	(%)	99

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	60
CBR 5.0 mm	54

Swell	(%)	0.1

Material CBR Value at achieved DD and MC	60

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29106** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0322
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 17/03/08

Lot number :
Chainage : CH. 11.158km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0322
MDD (t/m3)	2.168
OMC (%)	7.8
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.168
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	7.8
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.168
Achieved % MDD	(%)	100.0
Achieved Moist. Cont.	(%)	7.8
Achieved % OMC	(%)	100

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	23
CBR 5.0 mm	34

Swell	(%)	0.0

Material CBR Value at achieved DD and MC	34

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29108** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0337
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 18.900km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0337
MDD (t/m3)	2.161
OMC (%)	7.0
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	2.161
Nominated % MDD	(%)	100.0
Nominated Moist. Cont.	(%)	7.0
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	2.157
Achieved % MDD	(%)	99.8
Achieved Moist. Cont.	(%)	7.2
Achieved % OMC	(%)	103

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	78
CBR 5.0 mm	92

Swell	(%)	0.0

Material CBR Value at achieved DD and MC	92

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No :** 29111 Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0302
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 14/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 4.726km
Sample Loc.: 1.1m R of CL
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
11.3	1.985
10.5	2.003
9.7	1.983
8.4	1.966

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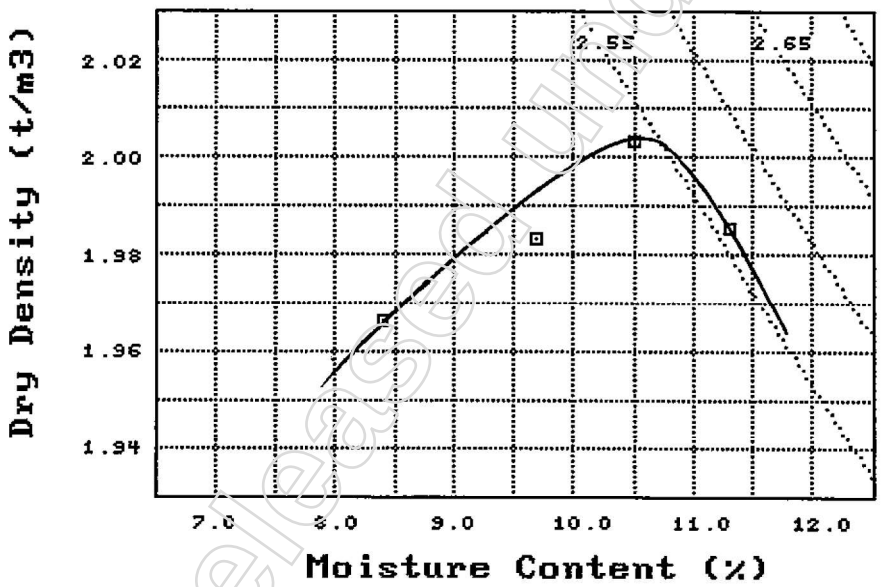
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	10.6
MDD (t/m3)	2.004

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29090 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0306
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 15/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 6.822km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
11.2	1.975
10.0	1.988
9.3	1.943
11.9	1.962

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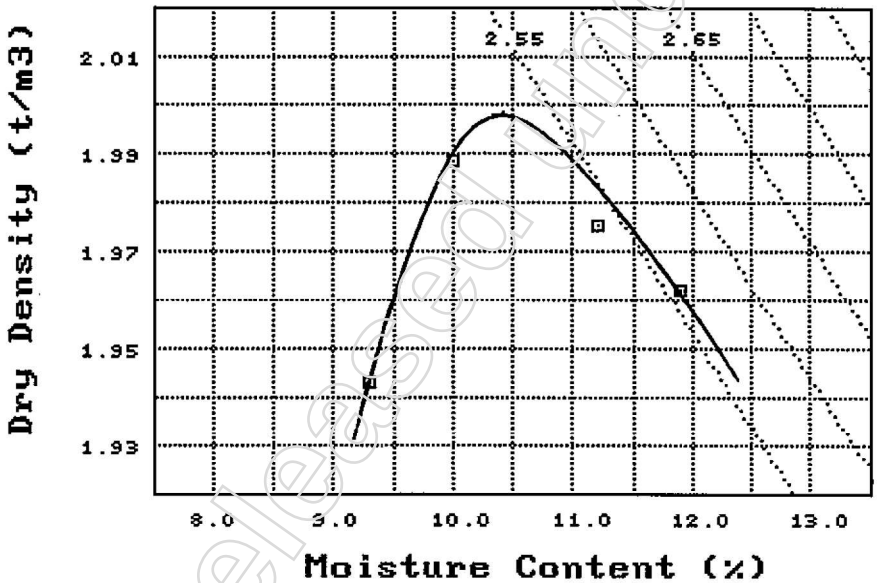
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	10.4
MDD (t/m3)	1.997

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
VARIATION TO METHOD CL 4.16

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29091 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0310	Lot Number	: Rqst No:-
Job Number	: 54/41F/507	Chainage	: CH. 7.526km
Item number	: 420	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Base
Date tested	: 15/03/08		

Moisture Content (%)	Dry Density (t/m3)
7.2	2.147
8.1	2.161
9.1	2.112
5.9	2.132

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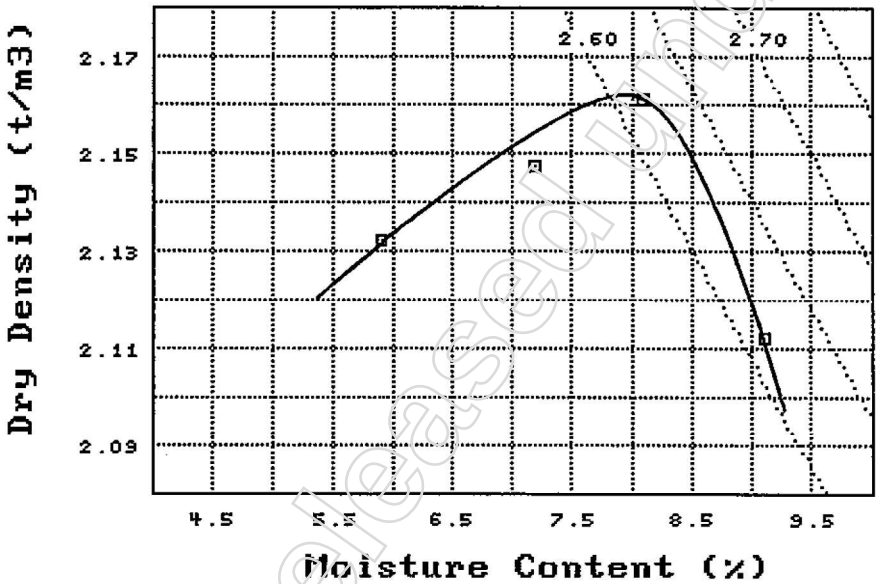
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	8.0
MDD (t/m3)	2.162

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29092 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0311	Lot Number	: Rqst No:
Job Number	: 54/41F/507	Chainage	: CH. 7.526km
Item number	: 421	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subbase
Date tested	: 15/03/08		

Moisture Content (%)	Dry Density (t/m3)
6.6	2.110
7.6	2.144
8.5	2.145
9.6	2.108

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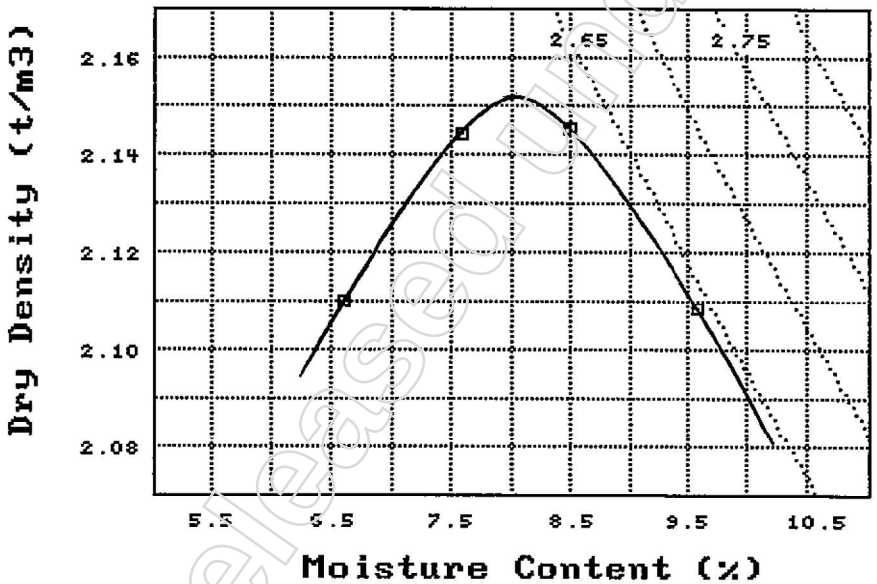
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	8.0
MDD (t/m3)	2.152

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29093 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
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Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0315	Lot Number	: Rqst No:
Job Number	: 54/41F/507	Chainage	: CH. 10.372km
Item number	: 420	Sample Loc.	: 1.8m R of CL OWP
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Base
Date tested	: 12/03/08		

Moisture Content (%)	Dry Density (t/m3)
9.5	2.086
8.3	2.127
7.3	2.109
6.5	2.035

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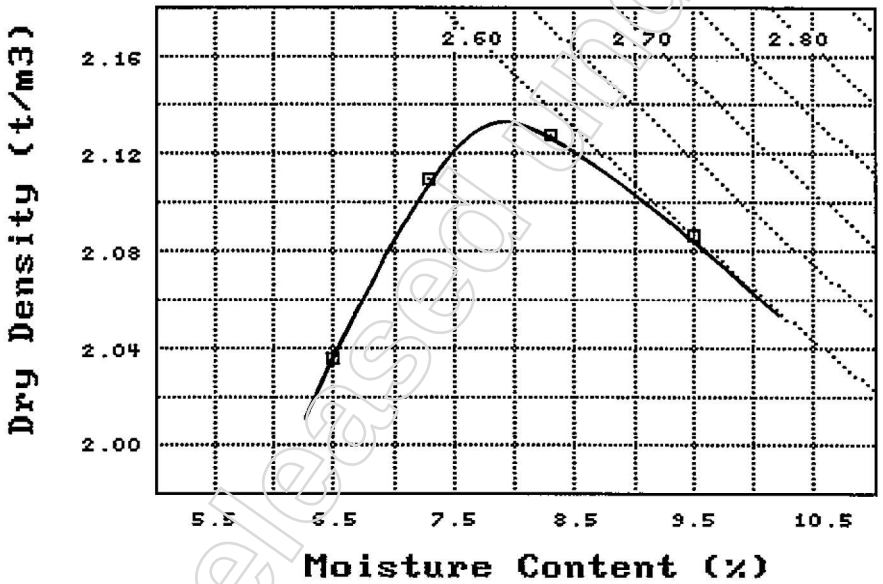
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	8.0
MDD (t/m3)	2.132

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29094** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
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Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0322
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 12/03/08

Lot Number : _____ Rqst No: _____
Chainage : CH. 11.158km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
8.5	2.139
7.9	2.167
6.6	2.125
5.5	2.070

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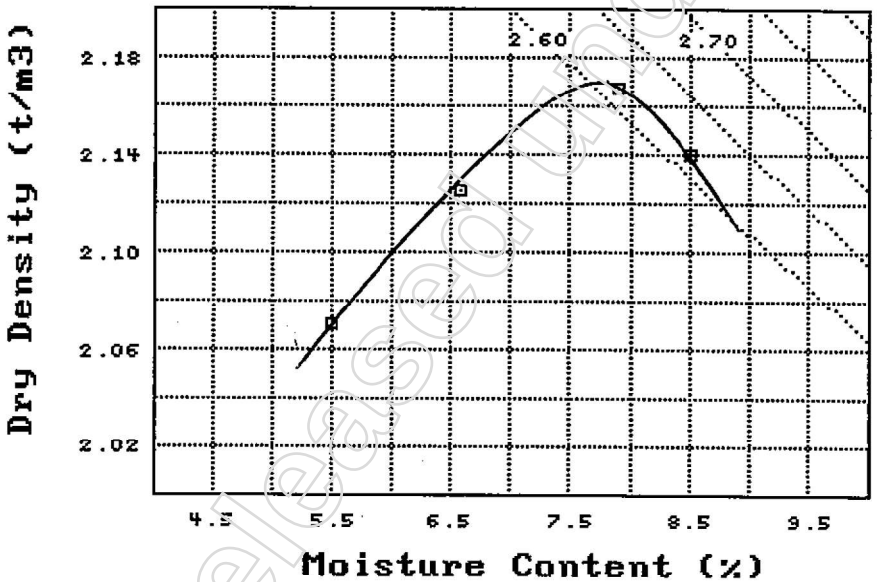
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	7.8
MDD (t/m3)	2.168

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29096** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0337
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 15/03/08

Lot Number : _____ Rqst No: _____
Chainage : CH. 18.900km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
7.3	2.156
6.1	2.126
8.5	2.107
5.5	2.052

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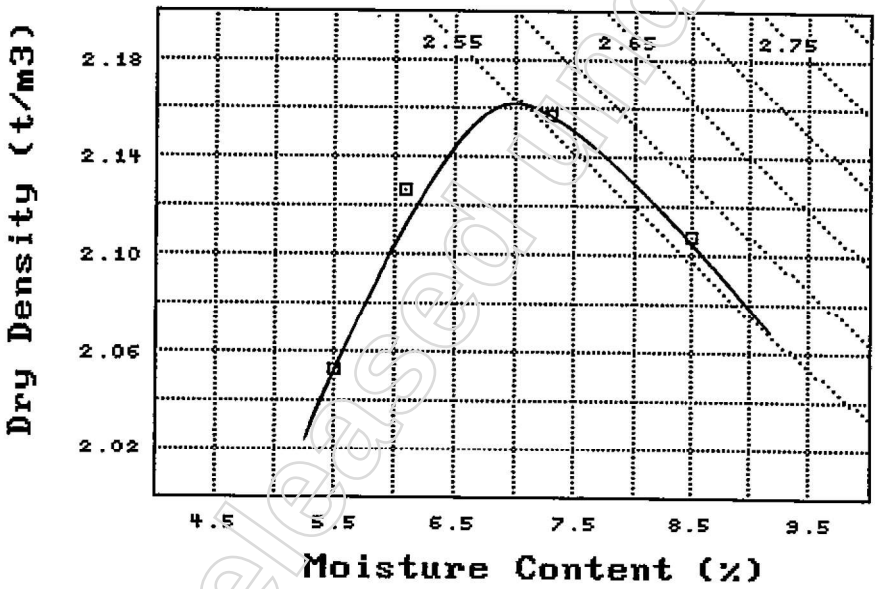
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	7.0
MDD (t/m3)	2.161

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29099 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0328
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 14/03/08

Lot Number : _____ Rqst No: _____
Chainage : CH. 17.270km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
8.3	2.101
7.6	2.068
9.9	2.054
6.6	2.026

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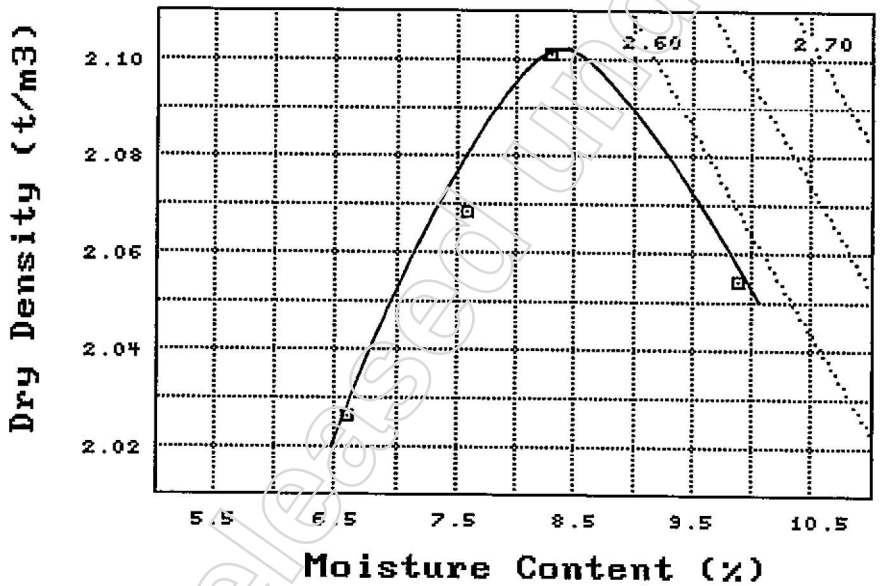
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	8.5
MDD (t/m3)	2.103

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : NR A.Williamson

Page : 1 of 1 **Report No : 29268** Date : 24/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0333
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 14/03/08

Lot Number : _____ Rqst No:
Chainage : CH. 18.195km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
9.1	2.088
8.7	2.037
10.5	2.066
7.6	1.976

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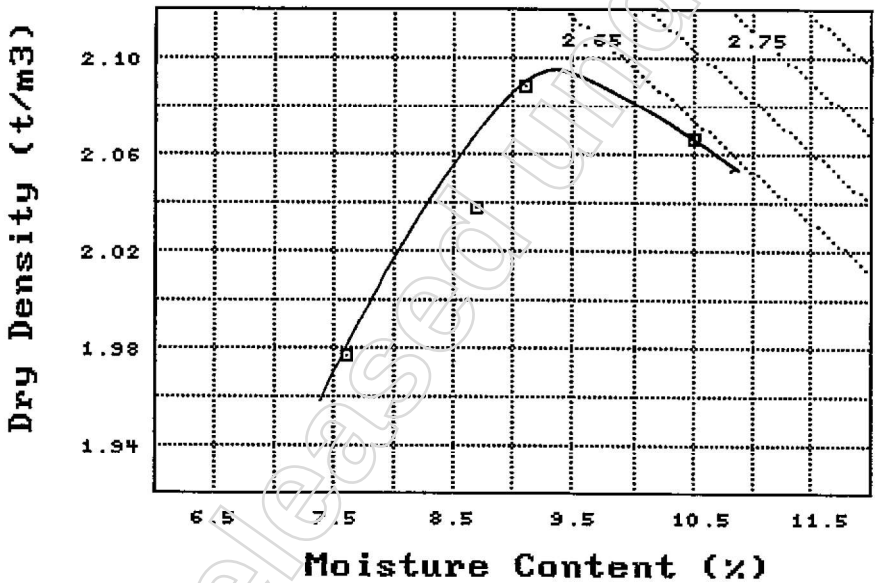
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	9.5
MDD (t/m3)	2.094

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : NR A.Williamson

Page : 1 of 1 **Report No : 29269** Date : 24/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

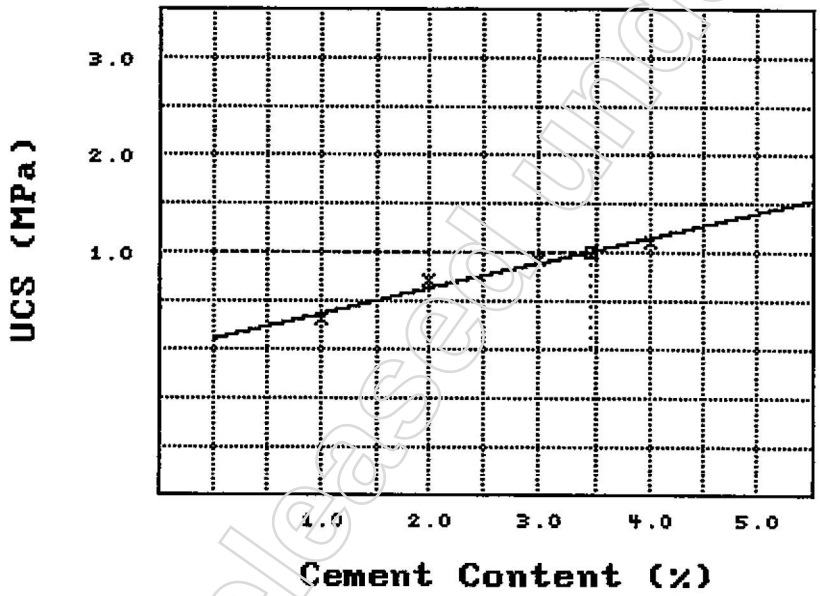
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0303
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 27/03/08

Chainage : CH. 4.726km
Sample Loc.: 1.1m R of CL
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
11.4	11.4	1.970	1.967	1.0	0.3
11.4	11.8	1.970	1.960	2.0	0.7
11.4	10.8	1.970	1.980	3.0	0.9
11.4	11.3	1.970	1.970	4.0	1.1



Target strength
1.0 MPa

Req. Cement Content
3.5 (%)

Additive type
GB Cement

Additive source
Cement Aus

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Remarks : - PORT ALMA section 1 pothole 1
CLIENT: MANAGER (P,D & D) ROCKHAMPTON

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page: 1 of 1 Report No : 29085 Date : 08/04/08 CF/0790/S12

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

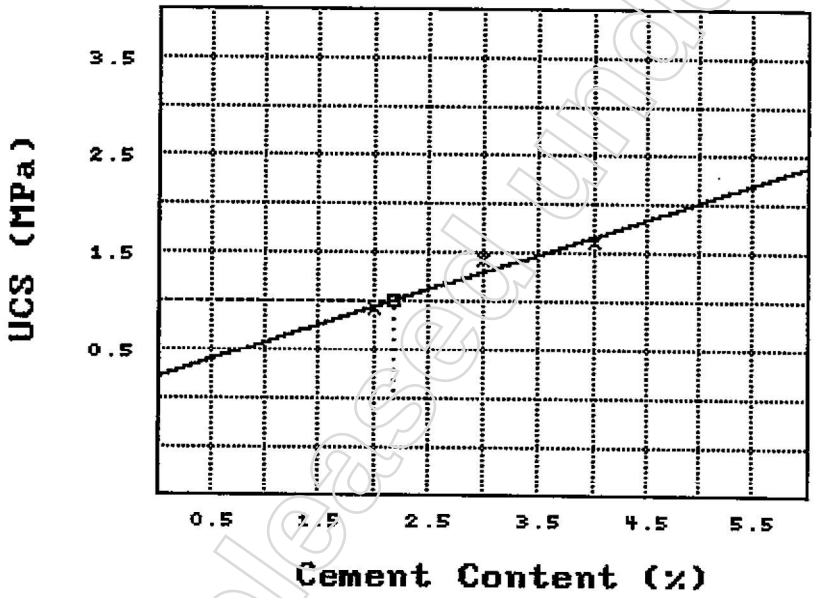
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0307
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 01/04/08

Chainage : CH. 6.822km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
10.2	10.4	1.957	1.950	2.0	0.9
10.2	10.4	1.957	1.950	2.0	0.9
10.2	10.0	1.957	1.960	3.0	1.4
10.2	10.4	1.957	1.953	4.0	1.6



Target strength

1.0 MPa

Req. Cement Content

2.2 (%)

Additive type
GB Cement

Additive source
Cement Aus

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Remarks : - PORT ALMA Section 2 Pothole 1
CLIENT: MANAGER (P, D & D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page: 1 of 1 **Report No : 29086** Date : 08/04/08 CF/0790/S12

Qld Dept. of Main Roads
Materials Services
Rockhampton

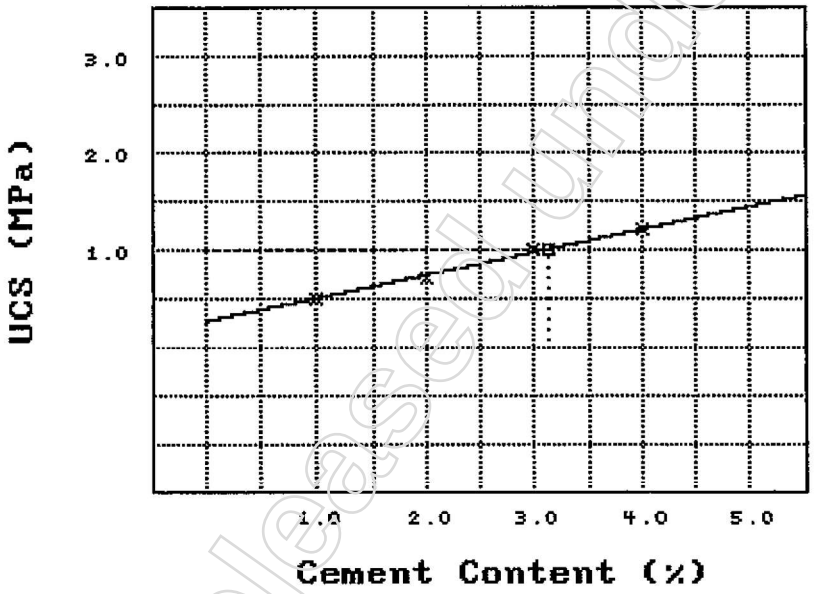
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0366
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No : SECT 2 PH2
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 27/03/08

Chainage : CH. 7.526km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
7.8	7.5	2.120	2.124	1.0	0.5
7.8	7.4	2.120	2.124	2.0	0.7
7.8	7.1	2.120	2.131	3.0	1.0
7.8	7.9	2.120	2.115	4.0	1.2



Target strength
1.0 MPa

Req. Cement Content
3.1 (%)

Additive type
GB CEMENT

Additive source
Cement Aus

Remarks : - Port Alma Section 2 Pothole 2
Client: Manager (PD&D) Rockhampton

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page: 1 of 1 Report No : 29012 Date : 28/03/08 CF/0790/S12

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

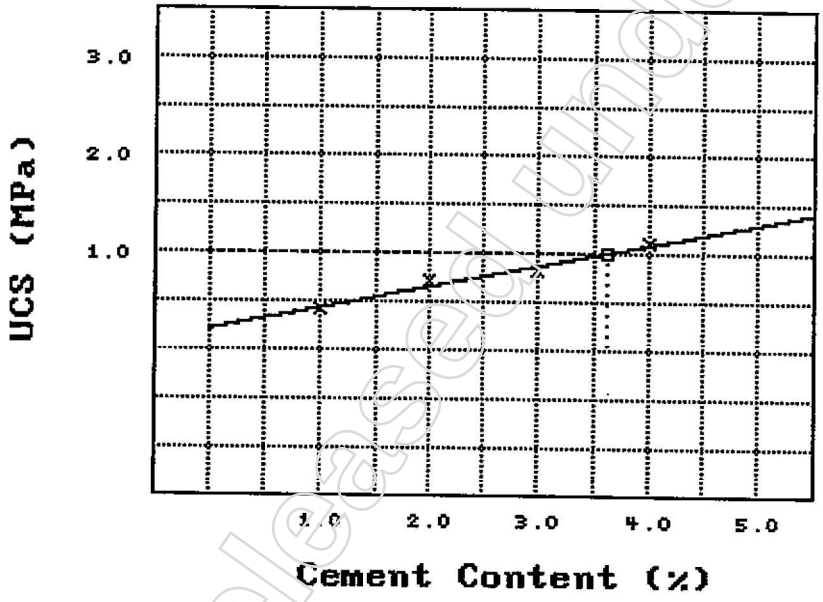
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0316
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 27/03/08

Chainage : CH. 10.372km
Sample Loc.: 1.8m R of CL OWP
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
8.2	8.1	2.080	2.081	1.0	0.4
8.2	7.8	2.080	2.087	2.0	0.7
8.2	8.0	2.080	2.082	3.0	0.8
8.2	7.4	2.080	2.093	4.0	1.1



Target strength
1.0 MPa

Req. Cement Content
3.6 (%)

Additive type
GB Cement

Additive source
Cement Aus

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Remarks : - PORT ALMA Section 3 trench 1
CLIENT: MANAGER (P,D & D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory NR W.A.Daniels

Page: 1 of 1 Report No : 29087 Date : 08/04/08 CF/0790/S12

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

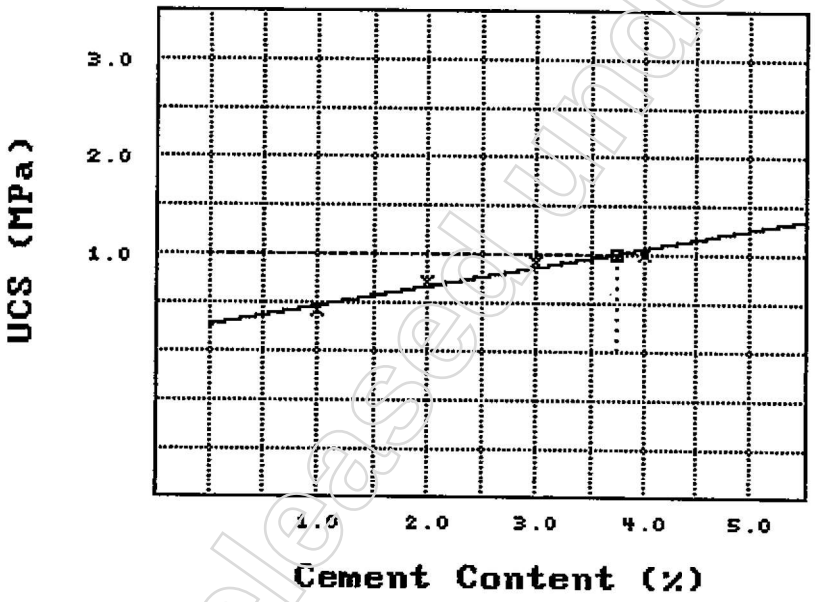
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0323
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 13/03/08

Chainage : CH. 11.158km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
8.0	8.3	2.107	2.099	1.0	0.4
8.0	7.6	2.107	2.113	2.0	0.7
8.0	8.4	2.107	2.096	3.0	0.9
8.0	8.0	2.107	2.104	4.0	1.0



Target strength
1.0 MPa

Req. Cement Content
3.8 (%)

Additive type
GB CEment

Additive source
Cement Aus

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Remarks : - PORT ALMA Section 3 Pothole 1
CLIENT: MANAGER (P, D & D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page: 1 of 1 Report No : 29088 Date : 08/04/08 CF/0790/S12

Qld Dept. of Main Roads
Materials Services
Rockhampton

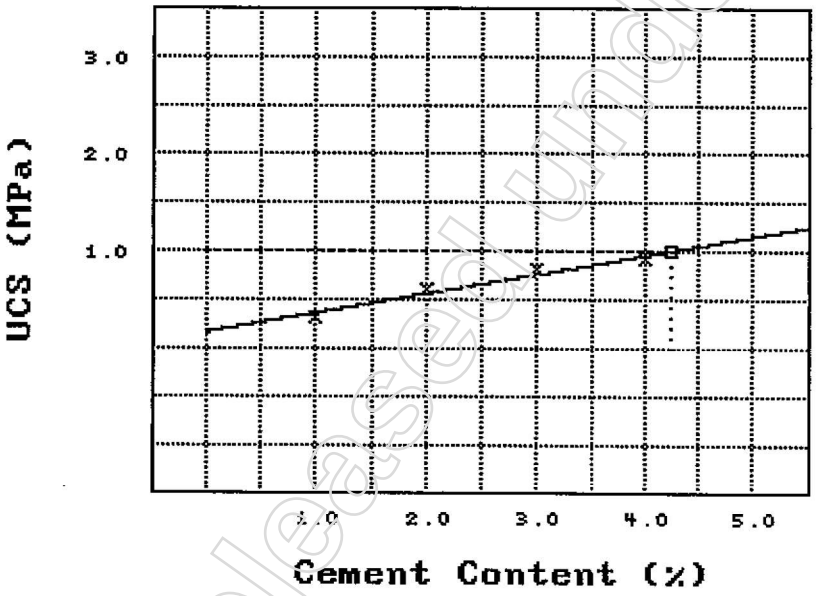
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0329
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No : SECT 4 PH2
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 27/03/08

Chainage : CH. 17.270km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
9.4	9.7	2.074	2.067	1.0	0.3
9.4	9.7	2.074	2.068	2.0	0.6
9.4	9.6	2.074	2.068	3.0	0.8
9.4	8.9	2.074	2.080	4.0	0.9



Target strength
1.0 MPa

Req. Cement Content
4.2 (%)

Additive type
GB CEMENT

Additive source
Cement Aus

Remarks : - Port Alma Section 4 Pothole 2
Client:Manager (PD&D) Rockhampton

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page: 1 of 1 Report No : 29009 Date : 28/03/08 CF/0790/S12

Accreditation Number: 2360
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Qld Dept. of Main Roads
Materials Services
Rockhampton

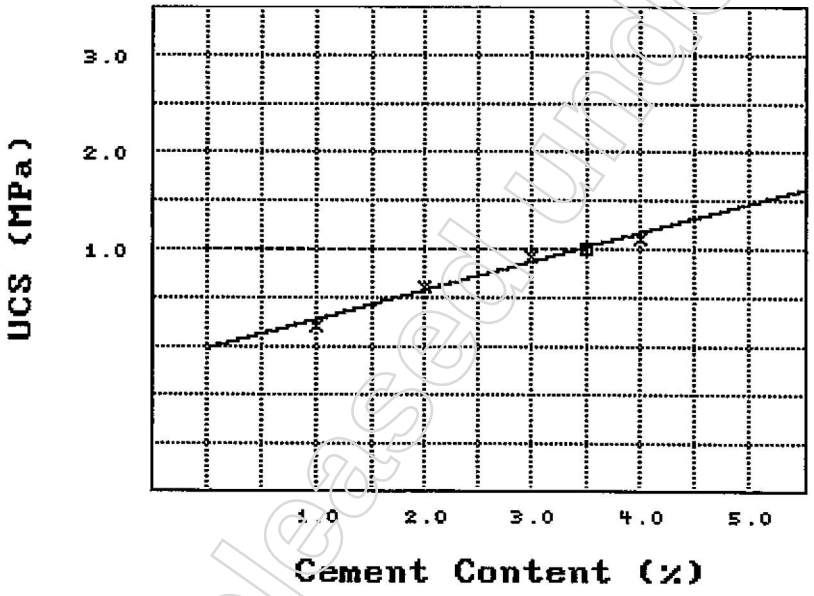
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0334
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No : SECT 5 PH2
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 27/03/08

Chainage : CH. 18.195km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
9.8	9.7	2.059	2.060	1.0	0.2
9.8	9.3	2.059	2.067	2.0	0.6
9.8	9.5	2.059	2.063	3.0	0.9
9.8	9.8	2.059	2.057	4.0	1.1



Target strength
1.0 MPa

Req. Cement Content
3.5 (%)

Additive type
GB CEMENT

Additive source
Cement Aus

Remarks : - Port Alma Section 5 Pothole 2
Client: Manager (PD&D) Rockhampton

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page: 1 of 1 Report No : 29010 Date : 28/03/08 CF/0790/S12

Accreditation Number: 2360
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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

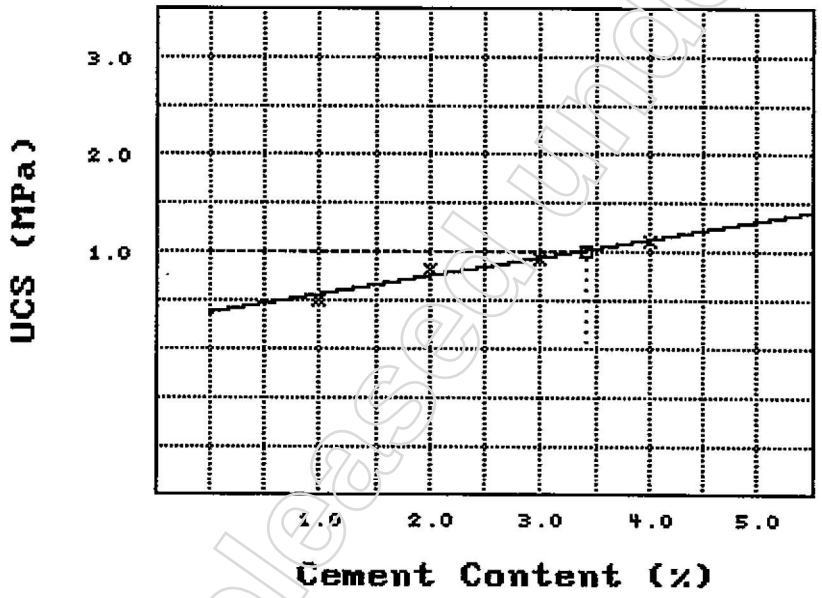
Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON DESIGN CEMENT CONTENT

Lab Number : R08/0338
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 01/04/08

Chainage : CH. 18.900km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
7.8	7.4	2.098	2.105	1.0	0.5
7.8	7.8	2.098	2.098	2.0	0.8
7.8	7.4	2.098	2.105	3.0	0.9
7.8	7.7	2.098	2.100	4.0	1.1



Target strength
1.0 MPa

Req. Cement Content
3.4 (%)

Additive type
GB Cement

Additive source
Cement Aus

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Remarks : - PORT ALMA Section 6 Pothole 1
CLIENT: MANAGER (P,D & D) ROCKHAMPTON

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

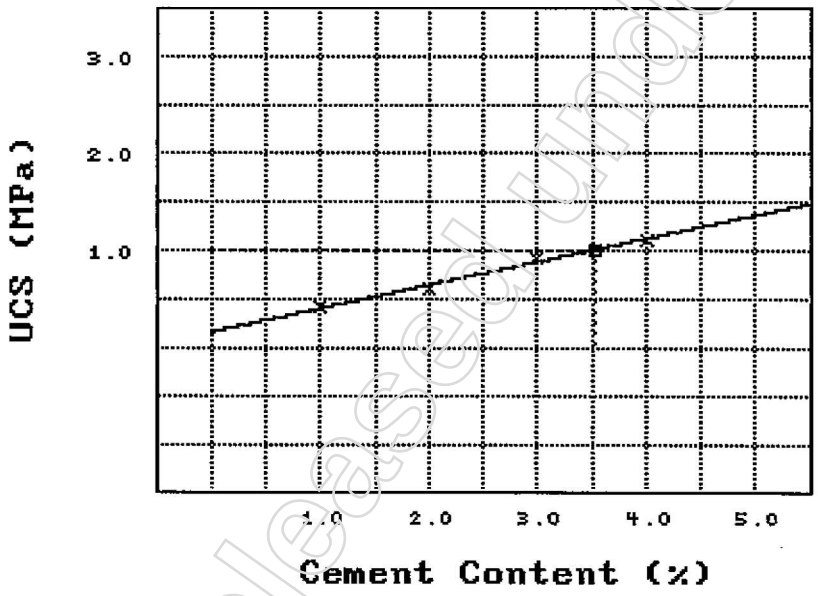
Page: 1 of 1 Report No : 29089 Date : 08/04/08 CF/0790/S12

Qld Dept. of Main Roads Materials Services Rockhampton	Rockhampton Laboratory 216 Richardson Road North Rockhampton Qld	**REPORT ON DESIGN CEMENT CONTENT**

Lab Number : R08/0341
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No : SECT 6 PH2
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 27/03/08

Chainage : CH. 19.700km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Test Method	(Q115)				
Target Moist Cont (%)	Average Moist Cont (%)	Target Dry Density (t/m3)	Average Dry Density (t/m3)	Cement Cont (%)	Average UCS (MPa)
9.2	9.4	2.053	2.050	1.0	0.4
9.2	9.1	2.053	2.054	2.0	0.6
9.2	8.2	2.053	2.072	3.0	0.9
9.2	9.3	2.053	2.051	4.0	1.1



Target strength
1.0 MPa

Req. Cement Content
3.5 (%)

Additive type
GB CEMENT

Additive source
Cement Aus

Remarks : - Port Alma Section 6 Pothole 2
Client:Manager (PD&D) Rockhampton

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page: 1 of 1 Report No : 29011 Date : 28/03/08 CF/0790/S12

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0303
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 20/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 4.726km
Sample Loc.: 1.1m R of CL

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
11.2	1.956
12.4	1.950
10.5	1.960
9.3	1.941

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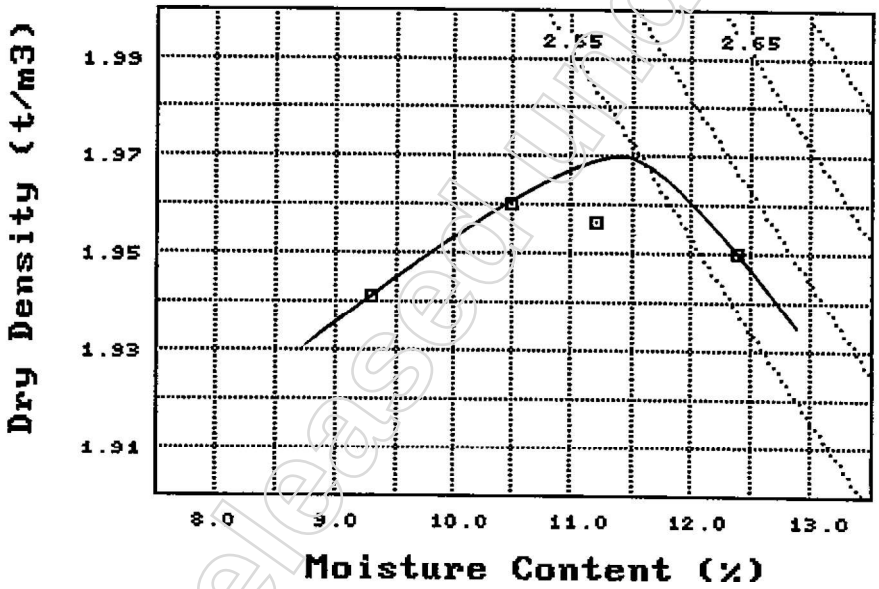
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100%STD

Test Method
Q110C

OMC (%)	11.4
MDD (t/m3)	1.970

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
PORT ALMA SECTION 2% GB CEMENT ADDED

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29080** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0307
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 15/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 6.822km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
9.5	1.934
11.5	1.933
9.0	1.900
12.7	1.918

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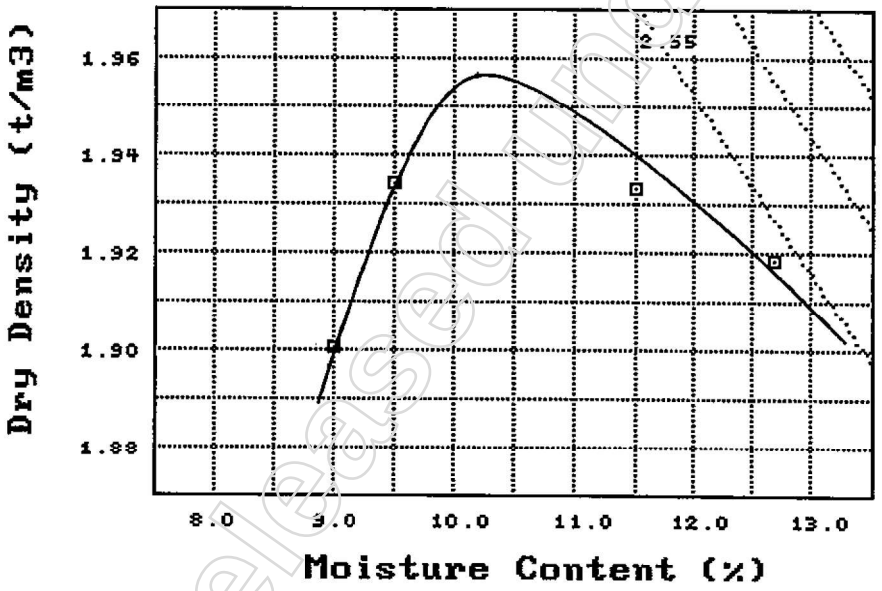
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort 100%STD

Test Method Q110C

OMC (%)	10.2
MDD (t/m3)	1.957

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON 2% GB CEMENT ADDED PORT ALMA SECTION 2 POTHOLE 1

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29081 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0366	Lot Number	: Rqst No:
Job Number	: 54/41F/507	Chainage	: CH. 7.526km
Item number	: 420	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	: SECT 2 PH2	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Base
Date tested	: 15/03/08		

Moisture Content (%)	Dry Density (t/m3)
7.9	2.110
9.0	2.100
7.0	2.111
5.9	2.087

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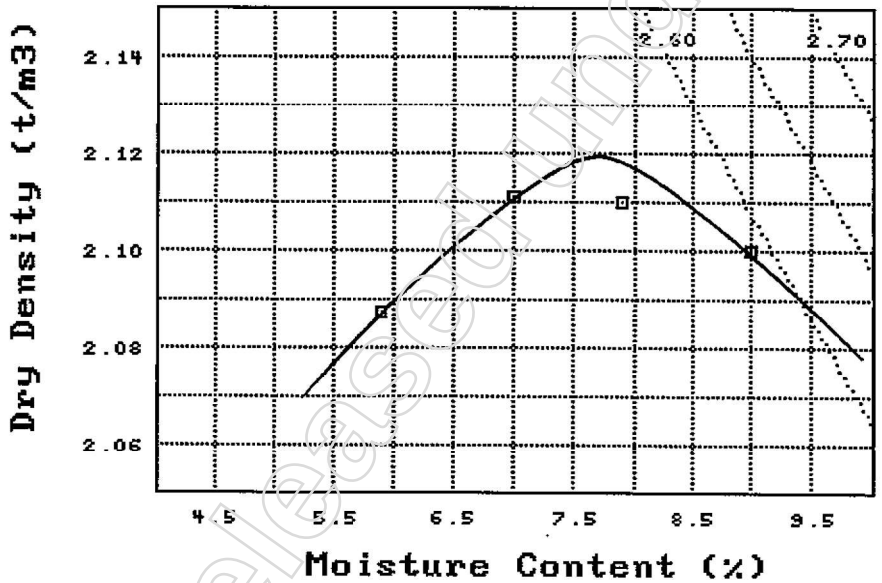
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110C

OMC (%)	7.8
MDD (t/m3)	2.120

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
Variation to method CL 4.XV 2% GB cement added

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29008 Date : 28/03/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0316
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 12/03/08

Lot Number : _____ Rqst No:
Chainage : CH. 10.372km
Sample Loc.: 1.8m R of CL OWP
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
7.6	2.064
8.7	2.072
9.7	2.044
6.7	2.007

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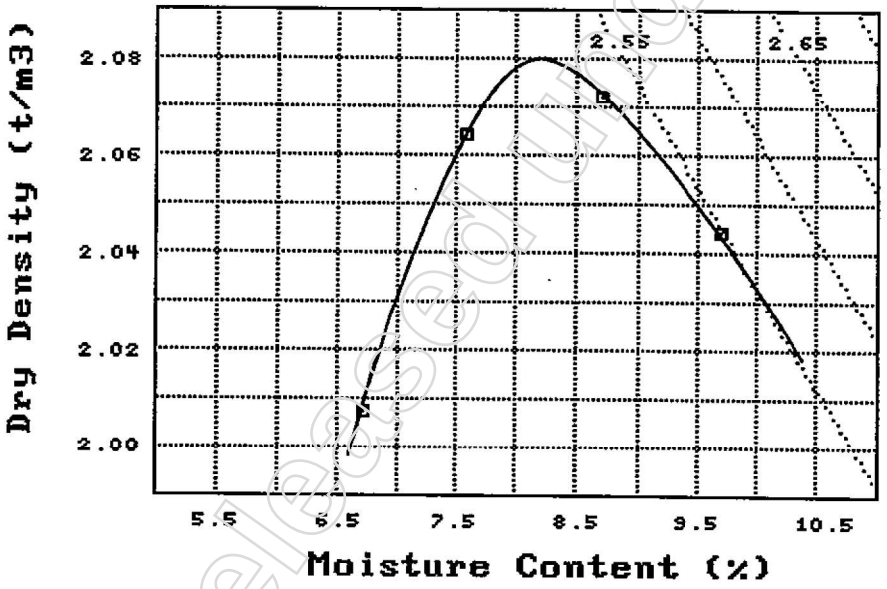
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort 100%STD

Test Method Q110C

OMC (%)	8.2
MDD (t/m3)	2.080

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON 2% GB CEMENT ADDED
PORT ALMA SECTION SECTION 3 TRENCH 1

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29082** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0323
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 12/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 11.158km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
8.0	2.106
9.2	2.076
7.4	2.094
6.4	2.060

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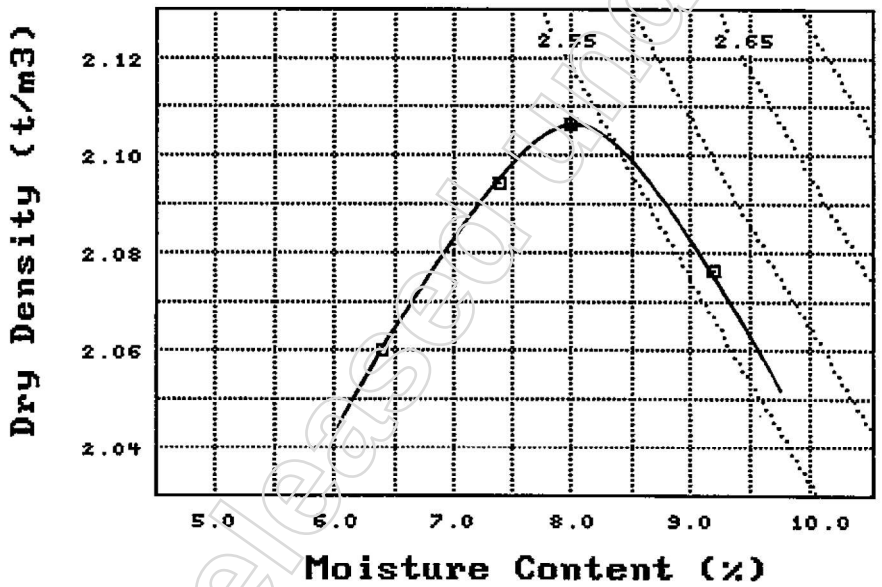
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort 100%STD

Test Method Q110C

OMC (%)	8.0
MDD (t/m3)	2.107

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON 2% GB CEMENT ADDED
PORT ALMA SECTION 3 POTHOLE 1

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 Report No : 29083 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0329
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No : SECT 4 PH2
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 14/03/08

Lot Number : _____ Rqst No: _____
Chainage : CH. 17.270km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
8.6	2.061
10.0	2.059
10.6	2.017
7.8	2.030

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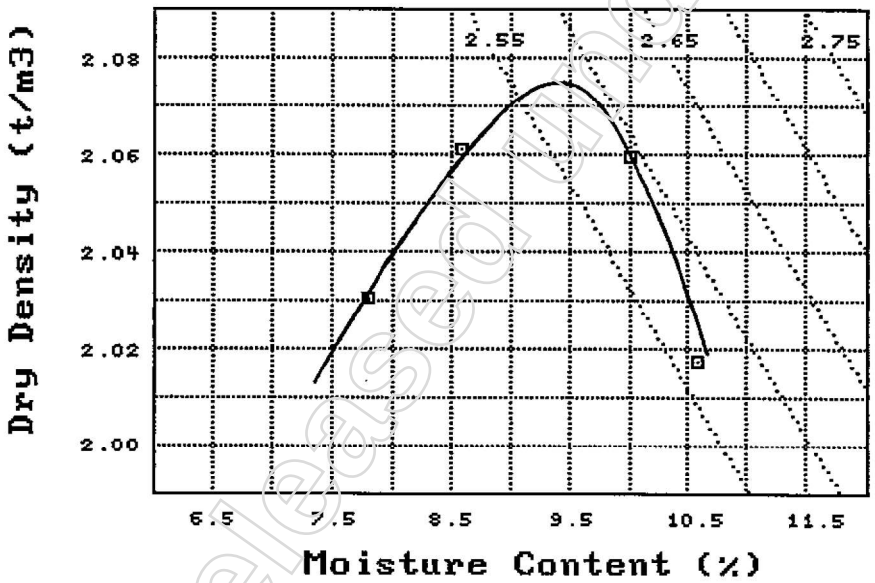
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110C

OMC (%)	9.4
MDD (t/m3)	2.074

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
Variation to method CL 4.XV 2% GB cement added

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29005** Date : 28/03/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0334	Lot Number	: Rqst No:
Job Number	: 54/41F/507	Chainage	: CH. 18.195km
Item number	: 420	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	: SECT 5 PH2	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 06/03/08	Item Desc.	: Base
Date tested	: 14/03/08		

Moisture Content (%)	Dry Density (t/m3)
8.2	2.022
9.3	2.053
10.2	2.049
10.9	2.018

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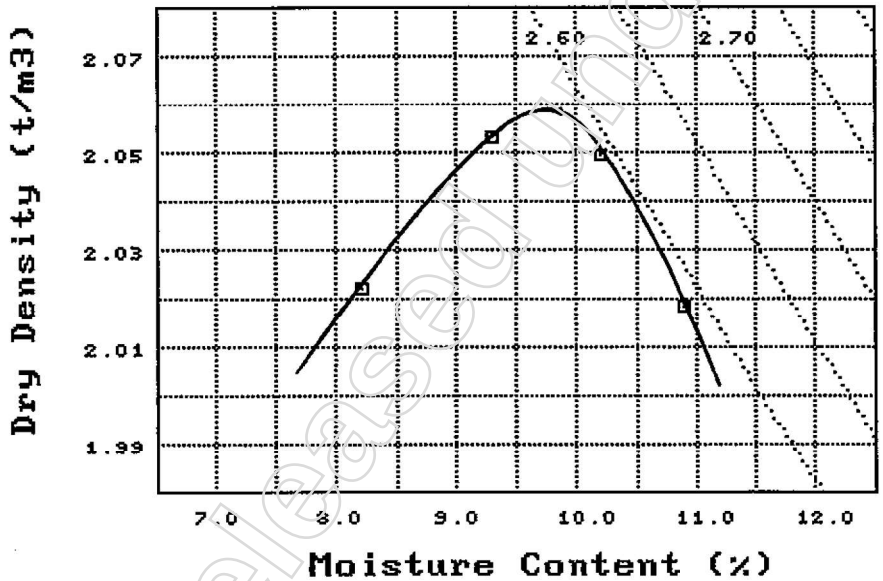
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110C

OMC (%)	9.8
MDD (t/m3)	2.059

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
Variation to method CL 4.XV 2% GB cement added

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29006** Date : 28/03/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0338
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 14/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 18.900km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
8.1	2.096
8.8	2.081
7.3	2.077
5.9	2.064

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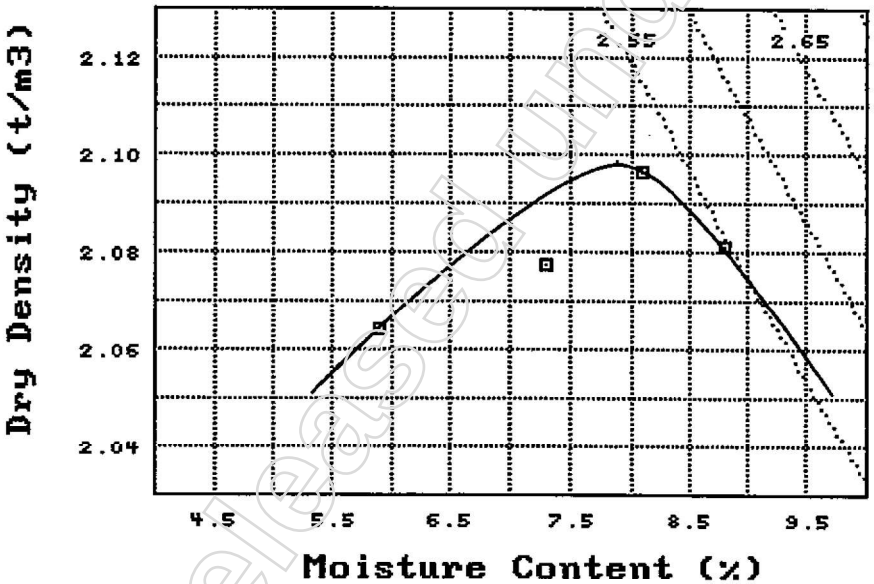
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100%STD

Test Method
Q110C

OMC (%)	7.8
MDD (t/m3)	2.098

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
2% GB CEMENT ADDED

Checked By : A.D.Maguire

Signatory : W.A.Daniels

Page : 1 of 1 Report No : 29084 Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0341
Job Number : 54/41F/507
Item number : 420
Submitted by : THIS LABORATORY
Senders No : SECT 6 PH2
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 12/03/08

Lot Number : _____ Rqst No: _____
Chainage : CH. 19.700km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Base

Moisture Content (%)	Dry Density (t/m3)
8.9	2.048
10.1	2.033
8.0	2.003
10.9	2.015

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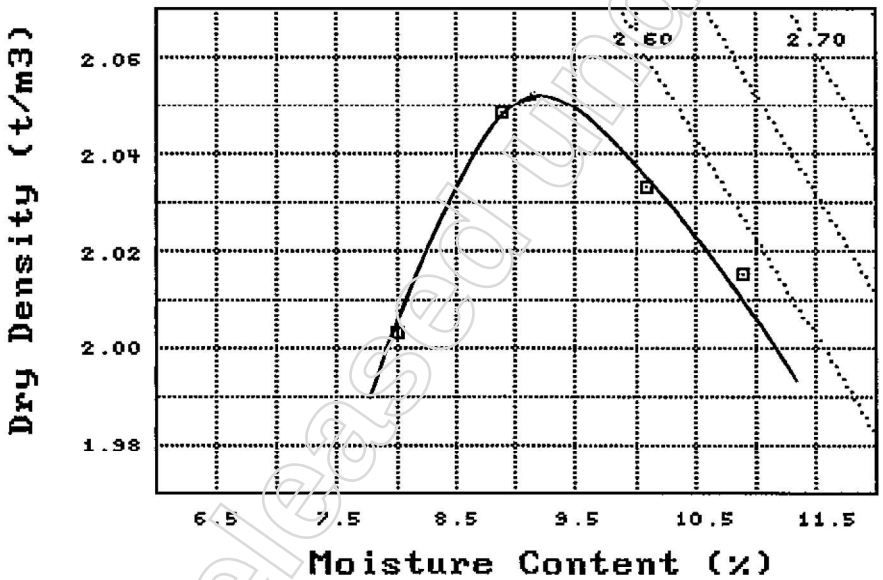
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110C

OMC (%)	9.2
MDD (t/m3)	2.053

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
Variation to method CL 4.xx 2% GB cement added

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29007** Date : 28/03/08 CF/0194/S39

Appendix 6

Subgrade Results

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 206

Mat Source : AS PER LOCATION
Item Desc. : Subgrade

Lab Number	R08/0309	R08/0318	R08/0332
Senders Number			
Lot Number			
Chainage	CH. 6.822km	CH. 10.372km	CH. 17.803km
Sample Location	RHS	1.8m R of CL OWP	RHS
Layer	-	-	-
Depth	-	-	-
Sampled By	THIS LABORATORY	THIS LABORATORY	THIS LABORATORY
Samp. Method	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4
Date Sampled	07/03/08	07/03/08	06/03/08
Date Tested	28/03/08	26/03/08	19/03/08

Percentage passing by mass (Q103A)

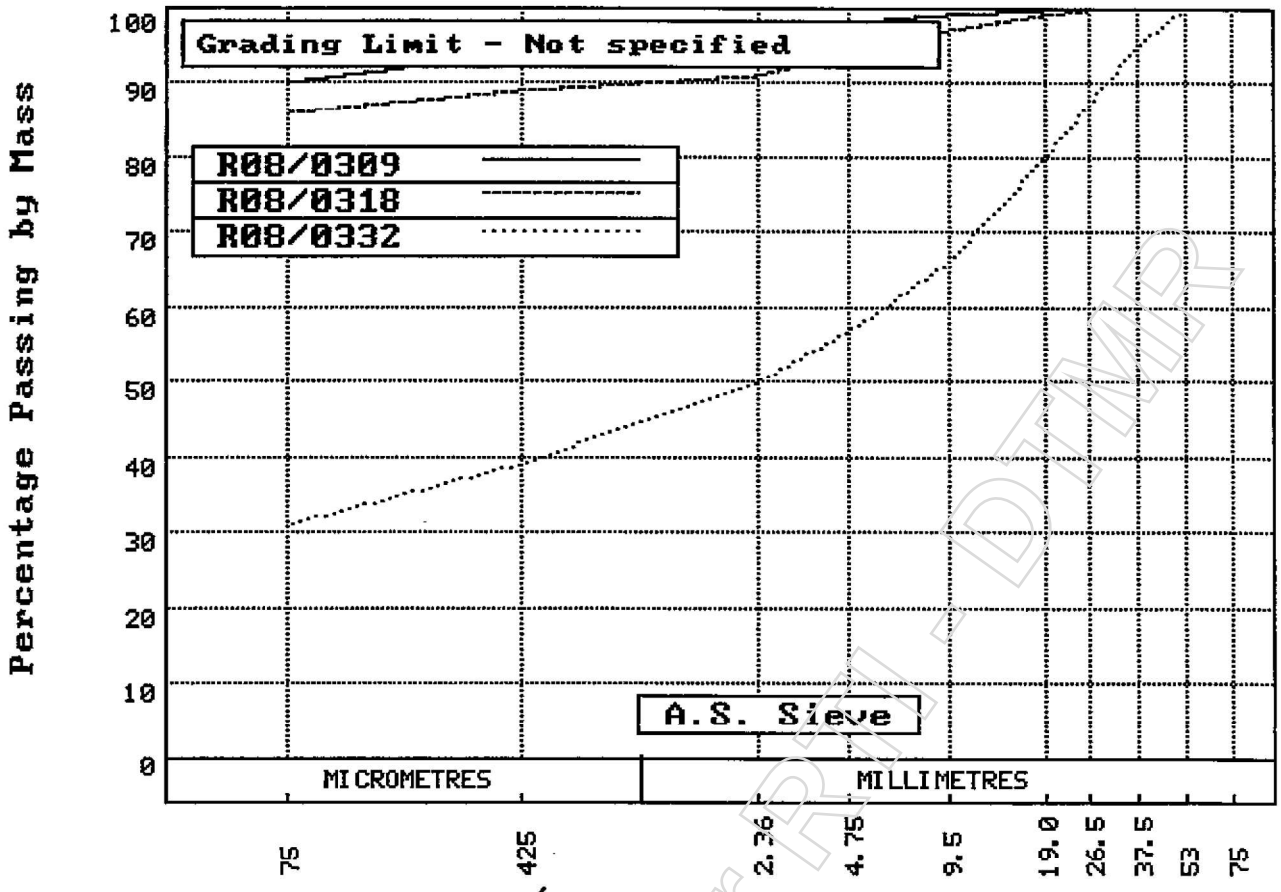
A.S. Sieve Size	Lab number R08/0309	R08/0318	R08/0332
75.0 mm			
53.0 mm			100
37.5 mm			95
26.5 mm		100	87
19.0 mm	100	99	80
9.5 mm	99	97	66
4.75 mm	98	94	57
2.36 mm	97	91	50
.425 mm	94	89	39
.075 mm	90	86	31

Tests	Results		
L.L. (Q104A/D)	52.6	44.8	32.2
P.I. (Q105)	31.8	24.6	8.8
L.S. (Q106)	17.0	12.8	3.2
M.A.L. (Q107)	-	-	-
P.I.* % < 0.425mm	2999	2189	341
L.S.* % < 0.425mm	1603	1139	124
Ratio 0.075/0.425	0.96	0.96	0.80

Remarks : R08/0309 - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0318 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0332 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON

NR

Signatory : W.A.Daniels



Checked By : W.A.Daniels		Signatory : W.A.Daniels	
Page: 2 of 2	Report No : 29235	Date : 23/04/08	CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 206

Mat Source : AS PER LOCATION
Item Desc. : Subgrade

Lab Number	R08/0324	R08/0330	R08/0335
Senders Number			
Lot Number			
Chainage	CH. 11.158km	CH. 17.270km	CH. 18.195km
Sample Location	RHS	RHS	RHS
Layer	-	-	-
Depth	-	-	-
Sampled By	THIS LABORATORY	THIS LABORATORY	THIS LABORATORY
Samp. Method	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4
Date Sampled	07/03/08	07/03/08	06/03/08
Date Tested	28/03/08	13/03/08	26/03/08

Percentage passing by mass (Q103A)

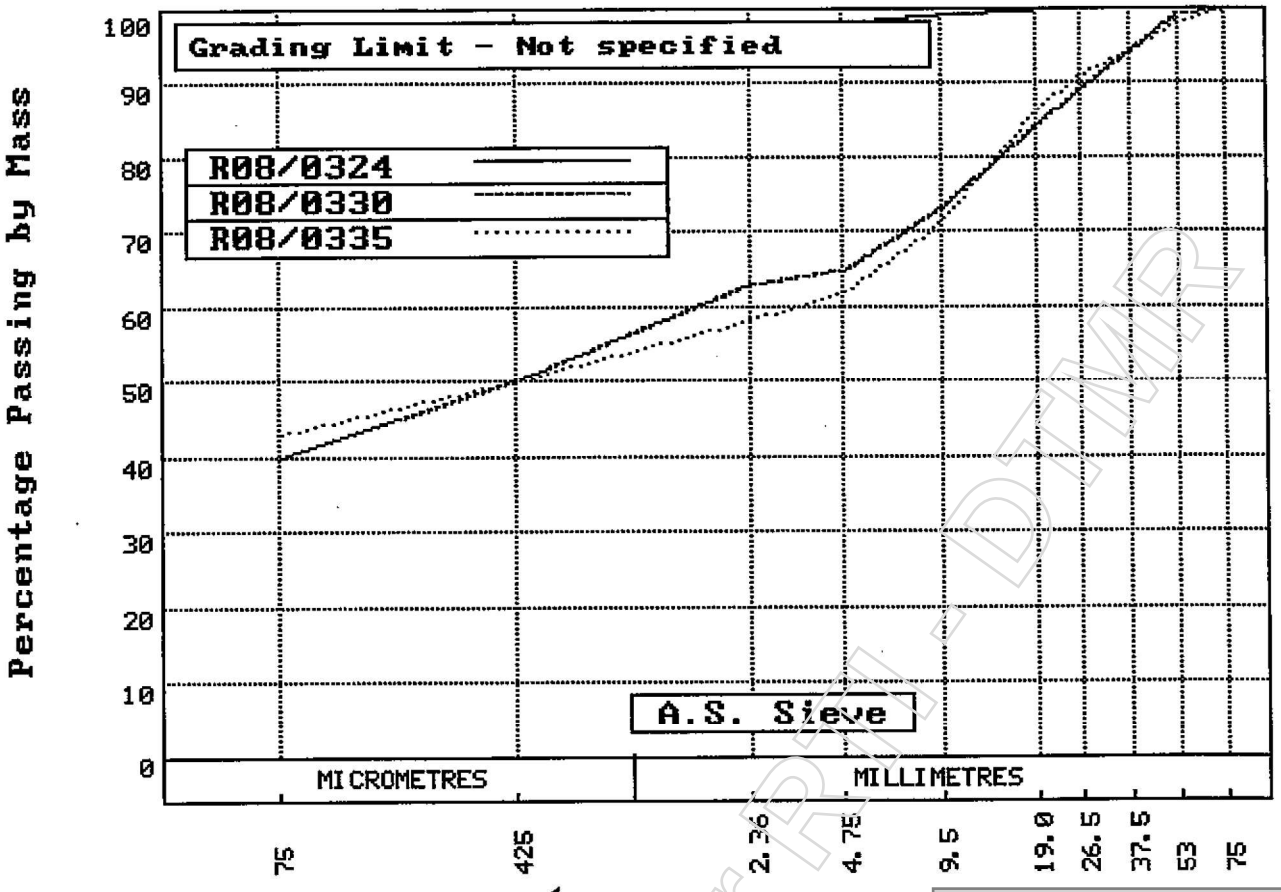
A.S. Sieve Size	Lab number R08/0324	R08/0330	R08/0335
75.0 mm		100	100
53.0 mm		99	98
37.5 mm		94	94
26.5 mm		89	91
19.0 mm	100	84	86
9.5 mm	99	73	71
4.75 mm	98	65	62
2.36 mm	97	63	58
.425 mm	95	50	50
.075 mm	93	40	43

Tests	Results		
L.L. (Q104A/D)	51.8	30.8	32.6
P.I. (Q105)	28.2	8.4	8.6
L.S. (Q106)	15.4	4.2	4.4
M.A.L. (Q107)	-	-	-
P.I.* % < 0.425mm	2676	418	433
L.S.* % < 0.425mm	1461	209	221
Ratio 0.075/0.425	0.98	0.80	0.85

Remarks : R08/0324 - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0330 - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0335 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON

NR

Signatory :
W.A.Daniels



Checked By : W.A.Daniels		Signatory W.A.Daniels	
Page: 2 of 2	Report No : 29236	Date : 23/04/08	CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON

GRADING (General)

Job Number : 54/41F/507
Submitted by : THIS LABORATORY
Item number : 206

Mat Source : AS PER LOCATION
Item Desc. : Subgrade

Lab Number	R08/0313	R08/0339	R08/0343
Senders Number			
Lot Number			
Chainage	CH. 7.526km	CH. 18.900km	CH. 19.700km
Sample Location	RHS	RHS	RHS
Layer	-	-	-
Depth	-	-	-
Sampled By	THIS LABORATORY	THIS LABORATORY	THIS LABORATORY
Samp. Method	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4	AS1289.1.2.1 cl 6.5.4
Date Sampled	07/03/08	06/03/08	06/03/08
Date Tested	02/04/08	20/03/08	20/03/08

Percentage passing by mass (Q103A)

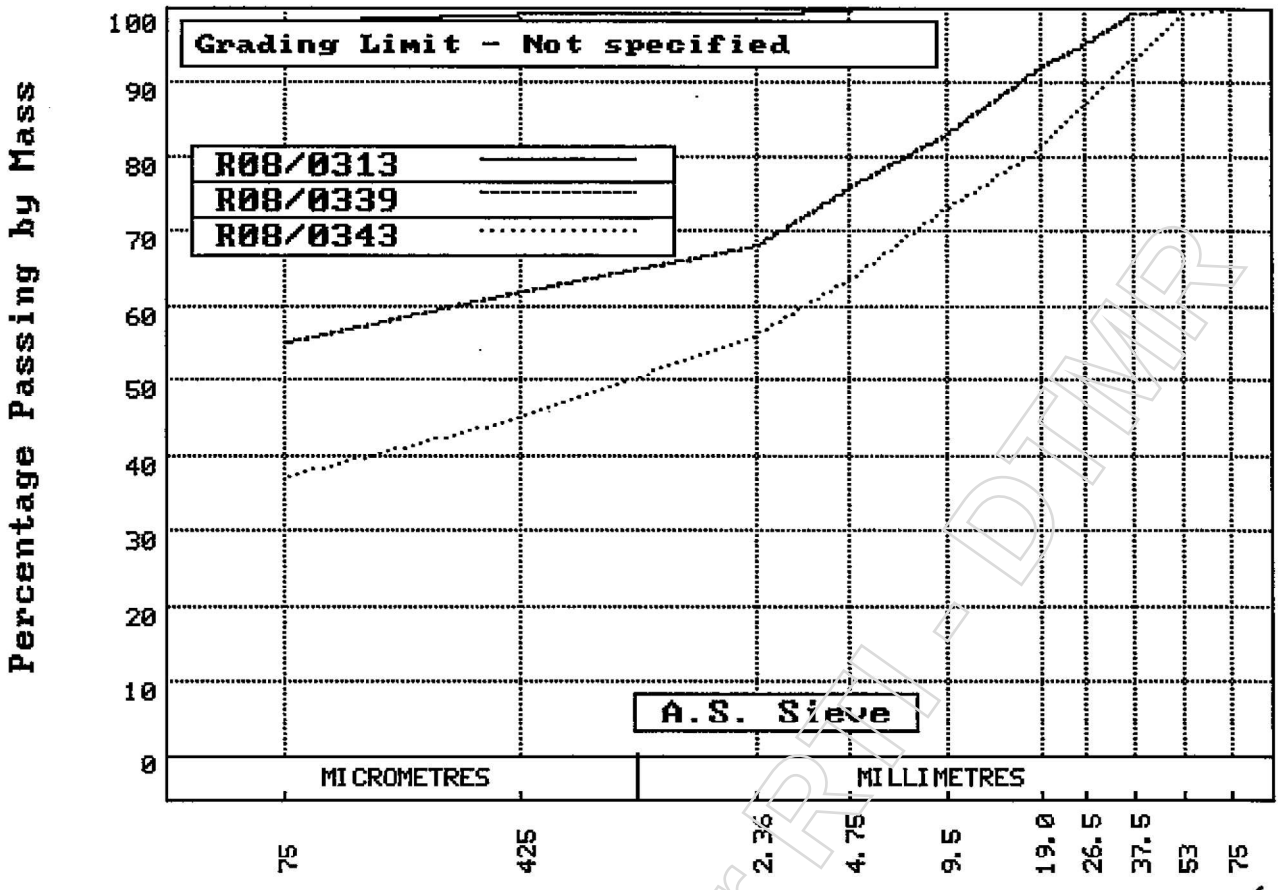
A.S. Sieve Size	Lab number R08/0313	R08/0339	R08/0343
75.0 mm			100
53.0 mm		100	99
37.5 mm		99	93
26.5 mm		95	87
19.0 mm		92	81
9.5 mm		83	73
4.75 mm	100	76	64
2.36 mm	99	68	56
.425 mm	99	62	45
.075 mm	98	55	37

Tests	Results		
L.L. (Q104A/D)	79.6	32.4	31.6
P.I. (Q105)	56.8	7.0	9.2
L.S. (Q106)	18.4	2.6	3.8
M.A.L. (Q107)	-	-	-
P.I.* % < 0.425mm	5600	433	417
L.S.* % < 0.425mm	1814	161	172
Ratio 0.075/0.425	0.99	0.88	0.82

Remarks : R08/0313 - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0339 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON
R08/0343 - - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Signatory : W.A.Daniels

NR



Checked By : W.A.Daniels		Signatory : W.A.Daniels	
Page: 2 of 2	Report No : 29237	Date : 23/04/08	CF/0790/S07

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number	: R08/0309	Lot number	:
Job Number	: 54/41F/507	Chainage	: CH. 6.822km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subgrade
Date tested	: 07/04/08		

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0309
MDD (t/m3)	1.596
OMC (%)	22.3
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.548
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	22.3
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.551
Achieved % MDD	(%)	97.2
Achieved Moist. Cont.	(%)	22.1
Achieved % OMC	(%)	99

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	2.0
CBR 5.0 mm	2.0

Swell	(%)	>3.3

Material CBR Value at achieved DD and MC	2.0

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29249** Date : 23/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number	: R08/0313	Lot number	:
Job Number	: 54/41F/507	Chainage	: CH. 7.526km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subgrade
Date tested	: 08/04/08		

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0313
MDD (t/m3)	1.541
OMC (%)	23.8
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.495
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	23.8
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.498
Achieved % MDD	(%)	97.2
Achieved Moist. Cont.	(%)	23.6
Achieved % OMC	(%)	99

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	0.8
CBR 5.0 mm	0.6

Swell	(%)	>6.9

Material CBR Value at achieved DD and MC	0.8

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON 4 DAY SOAK

Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29250** Date : 23/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number	: R08/0314	Lot number	:
Job Number	: 54/41F/507	Chainage	: CH. 7.526km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subgrade
Date tested	: 14/04/08		

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0313
MDD (t/m3)	1.541
OMC (%)	23.8
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.495
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	23.8
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.492
Achieved % MDD	(%)	96.8
Achieved Moist. Cont.	(%)	24.0
Achieved % OMC	(%)	101

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	1.0
CBR 5.0 mm	0.8

Swell	(%)	>6

Material CBR Value at achieved DD and MC	1.0

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON 10 DAY SOAK

Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29251** Date : 23/04/08 CF/0892/S37

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Accreditation Number: 2360
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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0318
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 10.372km
Sample Loc.: 1.8m R of CL OWP
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0318
MDD (t/m3)	1.538
OMC (%)	25.4
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.492
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	25.4
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.489
Achieved % MDD	(%)	96.8
Achieved Moist. Cont.	(%)	25.7
Achieved % OMC	(%)	101

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	3.5
CBR 5.0 mm	3.5

Swell	(%)	2.7

Material CBR Value at achieved DD and MC	3.5

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29107** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0324
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 07/04/08

Lot number :
Chainage : CH. 11.158km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0324
MDD (t/m3)	1.584
OMC (%)	23.2
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.536
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	23.2
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.539
Achieved % MDD	(%)	97.2
Achieved Moist. Cont.	(%)	22.9
Achieved % OMC	(%)	99

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	2.0
CBR 5.0 mm	1.5

Swell	(%)	3.7

Material CBR Value at achieved DD and MC	2.0

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29252** Date : 23/04/08 CF/0892/S37

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Qld Dept. of Main Roads — Rockhampton Laboratory — REPORT ON

Materials Services — 216 Richardson Road — SINGLE POINT

Rockhampton Laboratory — North Rockhampton Qld — CBR

Lab Number	: R08/0332	Lot number	:
Job Number	: 54/41F/507	Chainage	: CH. 17.803km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 06/03/08	Item Desc.	: Subgrade
Date tested	: 01/04/08		

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0332
MDD (t/m3)	2.034
OMC (%)	10.5
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.973
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	10.5
Nominated % OMC	(%)	100.0

Achieved Dry Density	(t/m3)	1.982
Achieved % MDD	(%)	97.4
Achieved Moist. Cont.	(%)	10.0
Achieved % OMC	(%)	95

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	26
CBR 5.0 mm	28

Swell	(%)	0.4

Material CBR Value at achieved DD and MC	28

Remarks : - CLIENT MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29109** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads — Rockhampton Laboratory

Materials Services
Rockhampton Laboratory

216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number	: R08/0335	Lot number	:
Job Number	: 54/41F/507	Chainage	: CH. 18.195km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 06/03/08	Item Desc.	: Subgrade
Date tested	: 01/04/08		

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0335
MDD (t/m3)	2.003
OMC (%)	10.5
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.943
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	10.5
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.938
Achieved % MDD	(%)	96.8
Achieved Moist. Cont.	(%)	10.8
Achieved % OMC	(%)	103

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	17
CBR 5.0 mm	17

Swell	(%)	1.2

Material CBR Value at achieved DD and MC	17

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29110** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number	: R08/0339	Lot number	:
Job Number	: 54/41F/507	Chainage	: CH. 18.900km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 06/03/08	Item Desc.	: Subgrade
Date tested	: 01/04/08		

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0339
MDD (t/m3)	1.870
OMC (%)	15.7
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.814
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	15.7
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.818
Achieved % MDD	(%)	97.2
Achieved Moist. Cont.	(%)	15.4
Achieved % OMC	(%)	98

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	10.0
CBR 5.0 mm	11

Swell	(%)	1.0

Material CBR Value at achieved DD and MC	11

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29112** Date : 08/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON SINGLE POINT CBR

Lab Number : R08/0343
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 01/04/08

Lot number :
Chainage : CH. 19.700km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0343
MDD (t/m3)	1.969
OMC (%)	11.2
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.910
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	11.2
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.919
Achieved % MDD	(%)	97.5
Achieved Moist. Cont.	(%)	10.7
Achieved % OMC	(%)	96

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	17
CBR 5.0 mm	17

Swell	(%)	1.3

Material CBR Value at achieved DD and MC	17

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29113** Date : 08/04/08 CF/0892/S37

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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Qld Dept. of Main Roads Materials Services Rockhampton	Rockhampton Laboratory 216 Richardson Road North Rockhampton Qld	**REPORT ON SINGLE POINT CBR**

Lab Number : R08/0330
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 15/03/08

Lot number :
Chainage : CH. 17.270km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

CBR Test Method	Q113C-1998
Test Condition	Soaked

MDR Details	
Sample Number	R08/0330
MDD (t/m3)	1.966
OMC (%)	11.4
MDR Test Method	Q110A-1996

Nominated Dry Density	(t/m3)	1.907
Nominated % MDD	(%)	97.0
Nominated Moist. Cont.	(%)	11.4
Nominated % OMC	(%)	100

Achieved Dry Density	(t/m3)	1.907
Achieved % MDD	(%)	97.0
Achieved Moist. Cont.	(%)	11.4
Achieved % OMC	(%)	100

MC after Penetration	(%)	-
MC Penetrated End	(%)	-

CBR 2.5 mm	9.0
CBR 5.0 mm	10.5

Swell	(%)	0.3

Material CBR Value at achieved DD and MC	10.5

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : NR A.Williamson

Page : 1 of 1 **Report No : 29263** Date : 24/04/08 CF/0892/S37

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Qld Dept. of Main Roads
Materials Services
Rockhampton

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0330
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 12/03/08

Lot Number : _____ Rqst No:
Chainage : CH. 17.270km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Subgrade

Moisture Content (%)	Dry Density (t/m3)
15.2	1.883
16.3	1.845
14.1	1.928
13.2	1.931
12.0	1.962
10.3	1.955

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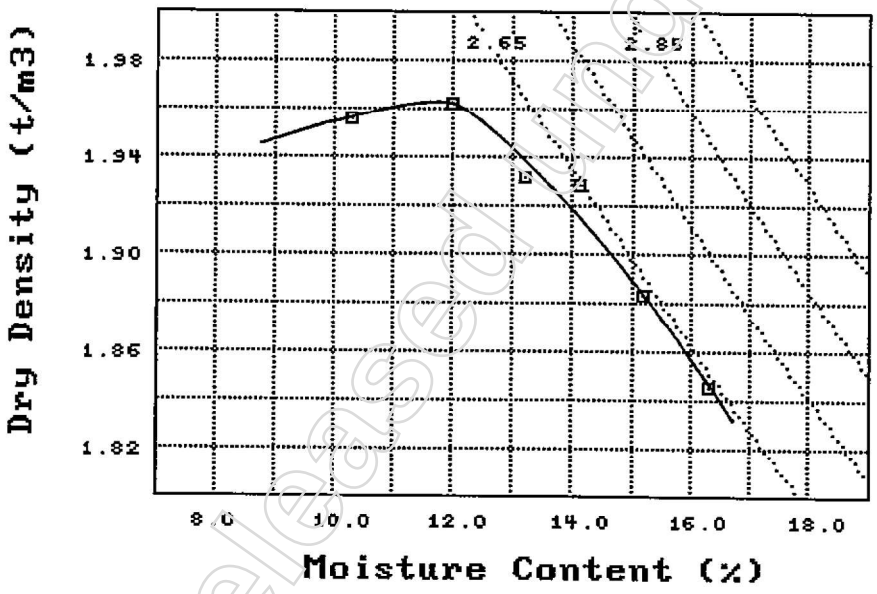
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	11.4
MDD (t/m3)	1.966

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR Matthew Wilson

Signatory : A.Williamson

Page : 1 of 1 Report No : 29267 Date : 24/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0309
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 07/03/08
Date tested : 27/03/08

Lot Number : _____ Rqst No:
Chainage : CH. 6.822km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

Moisture Content (%)	Dry Density (t/m3)
20.3	1.576
19.6	1.558
21.5	1.590
22.8	1.590
23.9	1.562

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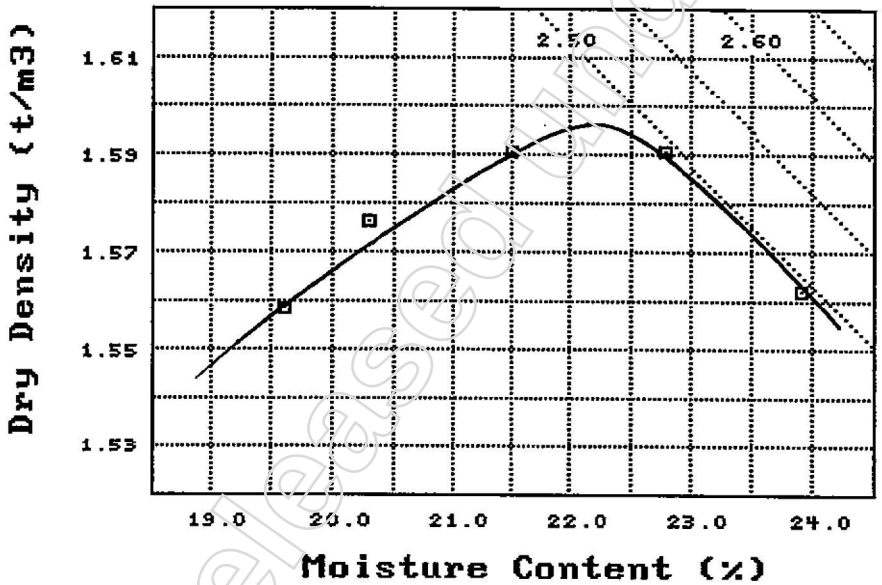
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	22.3
MDD (t/m3)	1.596

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29246** Date : 23/04/08 CF/0194/S39

Qld Dept of Main Roads — Rockhampton Laboratory — **REPORT ON**
Materials Services — 216 Richardson Road — **MOISTURE**
Rockhampton Laboratory — North Rockhampton Qld — **DENSITY RELATIONSHIP**

Lab Number	: R08/0313	Lot Number	: _____ Rqst No:
Job Number	: 54/41F/507	Chainage	: CH. 7.526km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subgrade
Date tested	: 31/03/08		

Moisture Content (%)	Dry Density (t/m3)
22.2	1.490
21.1	1.464
23.4	1.532
24.4	1.533

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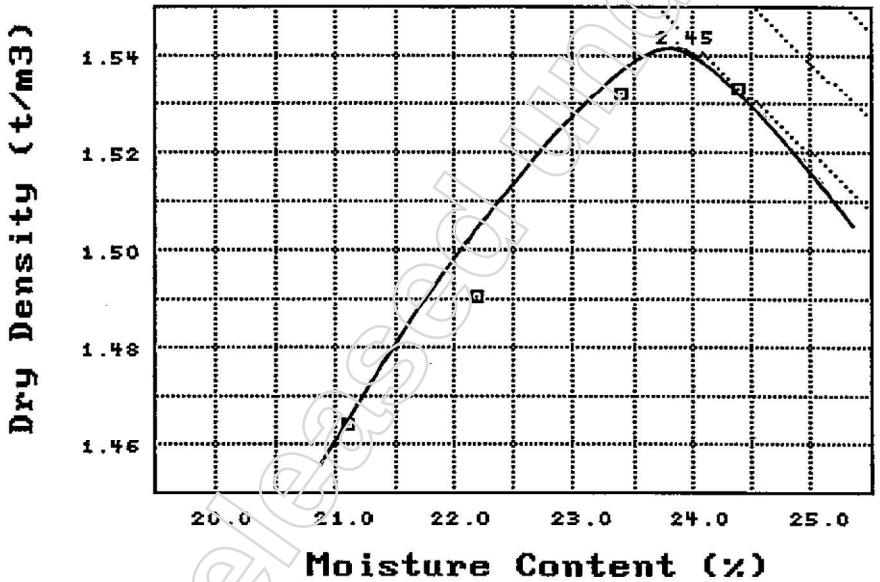
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	23.8
MDD (t/m3)	1.541

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR W.A.Daniels — Signatory : NR W.A.Daniels

Page : 1 of 1 — Report No : 29247 — Date : 23/04/08 — CF/0194/S39

Qld Dept of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0318	Lot Number	: Rqst No:-
Job Number	: 54/41F/507	Chainage	: CH. 10.372km
Item number	: 206	Sample Loc.	: 1.8m R of CL OWP
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subgrade
Date tested	: 26/03/08		

Moisture Content (%)	Dry Density (t/m3)
26.1	1.527
25.2	1.535
27.9	1.482
24.6	1.532
22.7	1.509

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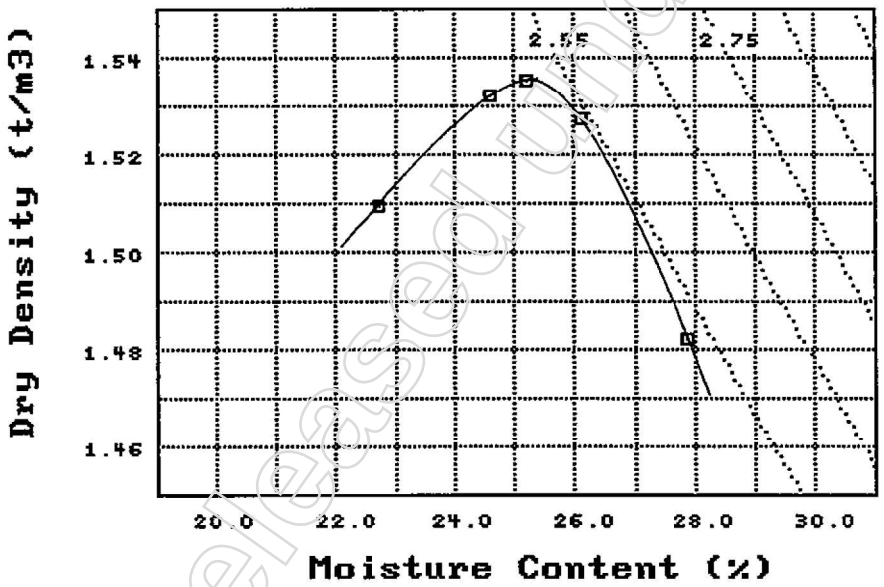
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort 100%STD

Test Method Q110A

OMC (%)	25.4
MDD (t/m3)	1.538

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29095** Date : 09/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number	: R08/0324	Lot Number	: Rqst No:
Job Number	: 54/41F/507	Chainage	: CH. 11.158km
Item number	: 206	Sample Loc.	: RHS
Submitted by	: THIS LABORATORY		
Senders No	:	Depth	: - Layer : -
Sampled By	: THIS LABORATORY	Mat Source	: AS PER LOCATION
Samp. Method	: AS1289.1.2.1 cl 6.5.4		
Date sampled	: 07/03/08	Item Desc.	: Subgrade
Date tested	: 29/03/08		

Moisture Content (%)	Dry Density (t/m3)
22.4	1.573
23.8	1.576
20.9	1.534
24.6	1.562

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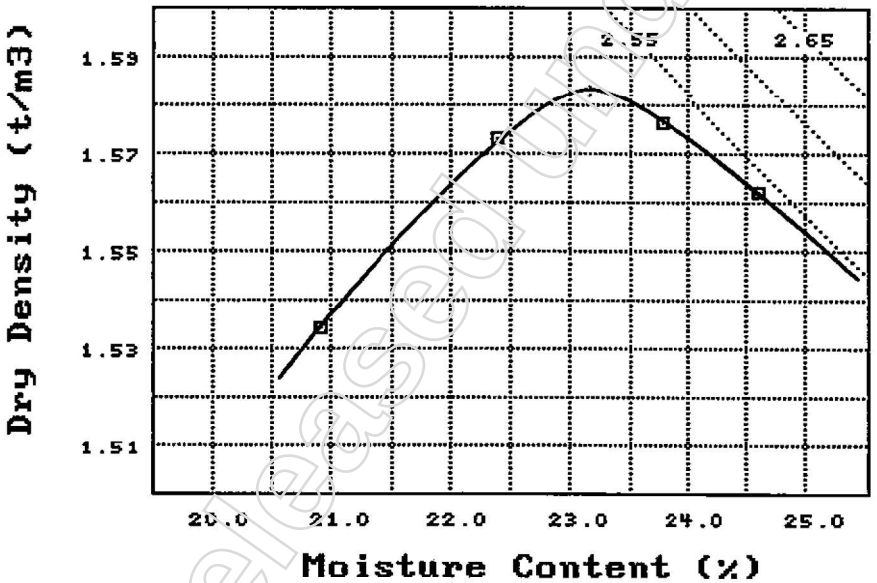
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	23.2
MDD (t/m3)	1.584

Remarks : CLIENT-MANAGER (PD&D) ROCKHAMPTON

Checked By : NR W.A.Daniels

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29248** Date : 23/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0332
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 26/03/08

Lot Number : _____ Rqst No:
Chainage : CH. 17.803km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

Moisture Content (%)	Dry Density (t/m3)
13.6	1.945
12.9	1.970
11.3	2.030
10.5	2.034
9.2	2.030

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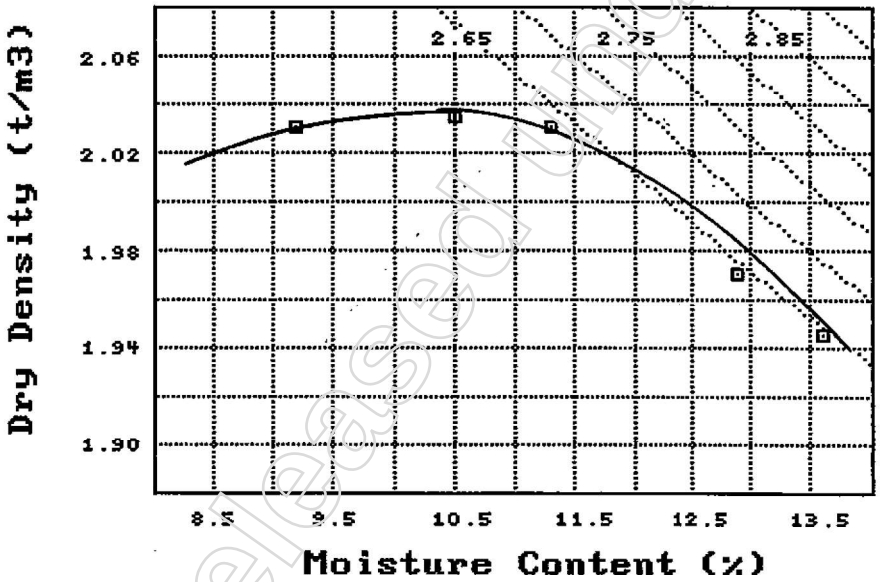
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	10.5
MDD (t/m3)	2.034

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
VARIATION TO METHOD Cl 4.16

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29097** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0335
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 15/03/08

Lot Number : _____ Rqst No: _____
Chainage : CH. 18.195km
Sample Loc.: RHS
Depth : - Layer : -
Mat Source : AS PER LOCATION
Item Desc. : Subgrade

Moisture Content (%)	Dry Density (t/m3)
15.2	1.892
13.7	1.940
13.3	1.967
12.2	1.981
10.8	2.002
8.7	1.978

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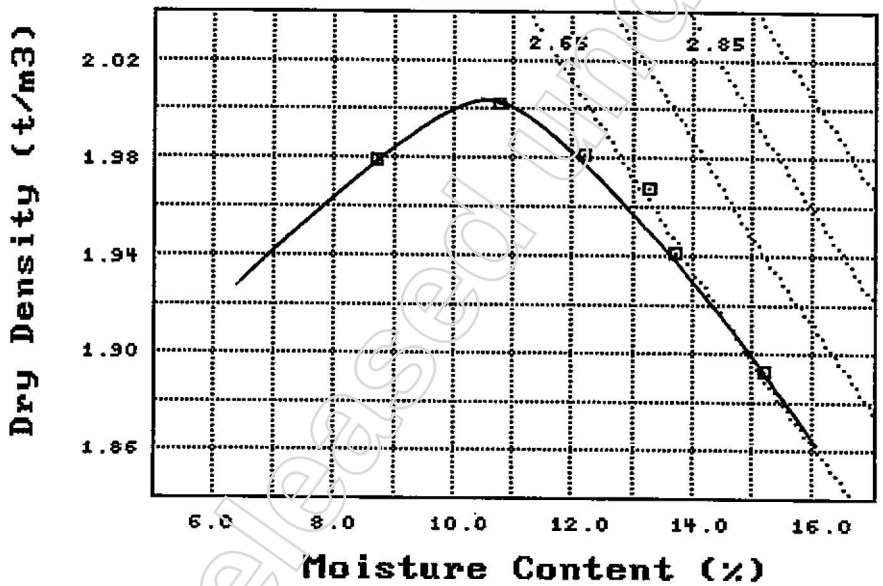
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	10.5
MDD (t/m3)	2.003

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
VARIATION TO METHOD C1. 4.16

Checked By : NR A.D.Maguire
Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29098** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0339
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 26/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 18.900km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Subgrade

Moisture Content (%)	Dry Density (t/m3)
16.6	1.847
15.3	1.861
14.8	1.830
17.5	1.802

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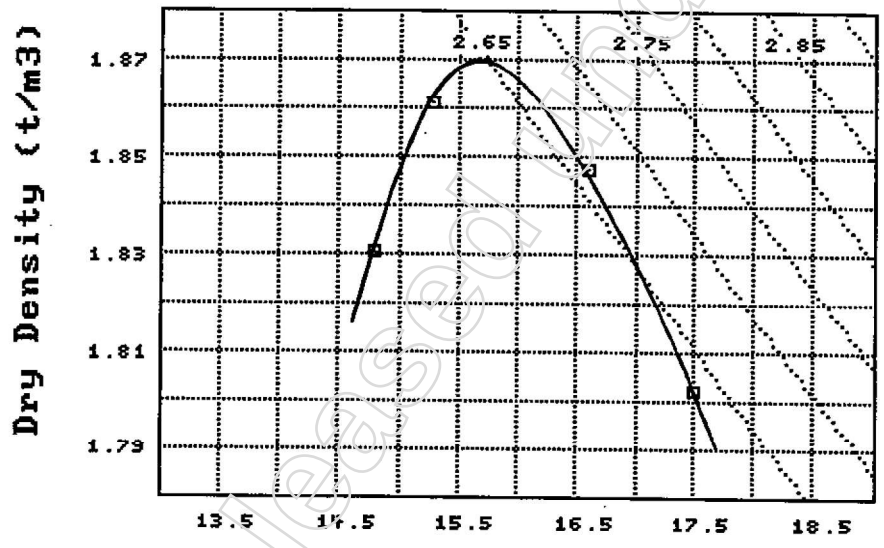
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	15.7
MDD (t/m3)	1.870

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
VARIATION TO METHOD Cl. 4.16

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29100** Date : 08/04/08 CF/0194/S39

Qld Dept. of Main Roads
Materials Services
Rockhampton Laboratory

Rockhampton Laboratory
216 Richardson Road
North Rockhampton Qld

REPORT ON MOISTURE DENSITY RELATIONSHIP

Lab Number : R08/0343
Job Number : 54/41F/507
Item number : 206
Submitted by : THIS LABORATORY
Senders No :
Sampled By : THIS LABORATORY
Samp. Method : AS1289.1.2.1 cl 6.5.4
Date sampled : 06/03/08
Date tested : 26/03/08

Lot Number : _____ Rqst No:-
Chainage : CH. 19.700km
Sample Loc.: RHS

Depth : - Layer : -
Mat Source : AS PER LOCATION

Item Desc. : Subgrade

Moisture Content (%)	Dry Density (t/m3)
11.9	1.956
10.5	1.962
9.5	1.947
13.0	1.929

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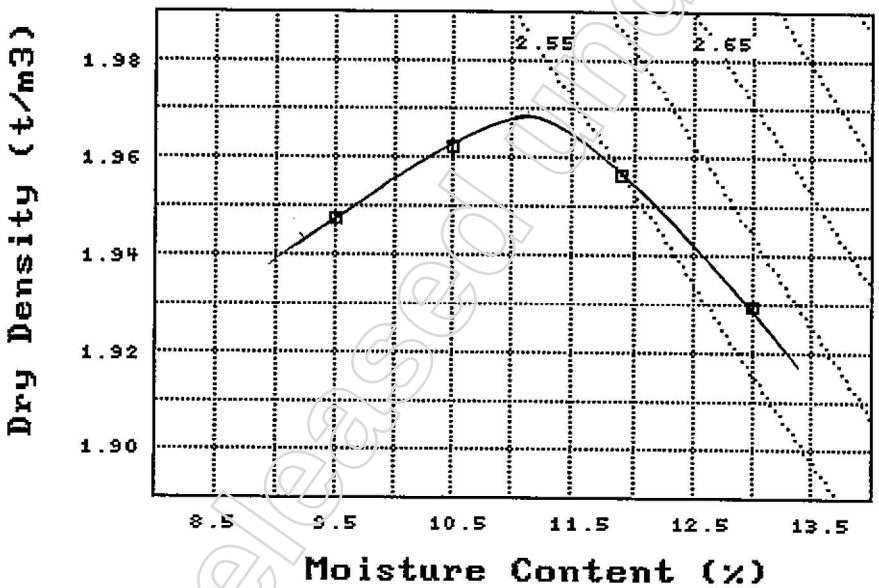
Moisture Content Test Method	Q102A
Mould Dia. (mm)	105

Max Particle Size (mm)	19.0
Oversize Stone >37.5mm (%)	0
Density of Oversize (t/m3)	-



M.D.R. Comp. Effort
100% STD

Test Method
Q110A

OMC (%)	11.2
MDD (t/m3)	1.969

Remarks : - CLIENT-MANAGER (PD&D) ROCKHAMPTON
VARIATION TO METHOD C1 4.16

Checked By : NR A.D.Maguire

Signatory : NR W.A.Daniels

Page : 1 of 1 **Report No : 29101** Date : 08/04/08 CF/0194/S39

Appendix 7

Photographs of Trenches / Potholes

Photo A7-1: Section1, Site 1

Photo A7-2: Section1, Site 1 (LHS)

Photo A7-3: Section1, Site 1 (RHS)

Photo A7-4: Section1, Pothole 1

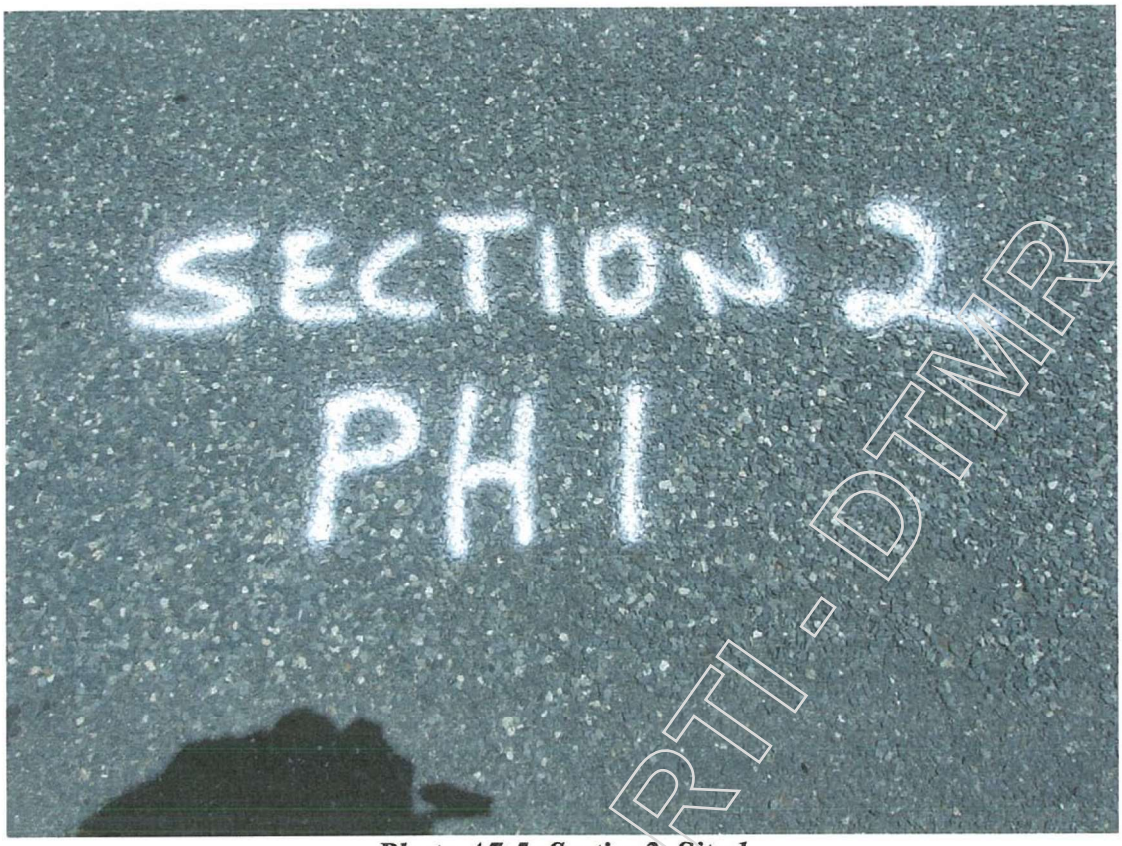


Photo A7-5: Section2, Site 1

Photo A7-6: Section 2, Site 1 (LHS)

Photo A7-7: Section 2, Site 1 (RHS)

Photo A7-8: Section 2, Pothole 1

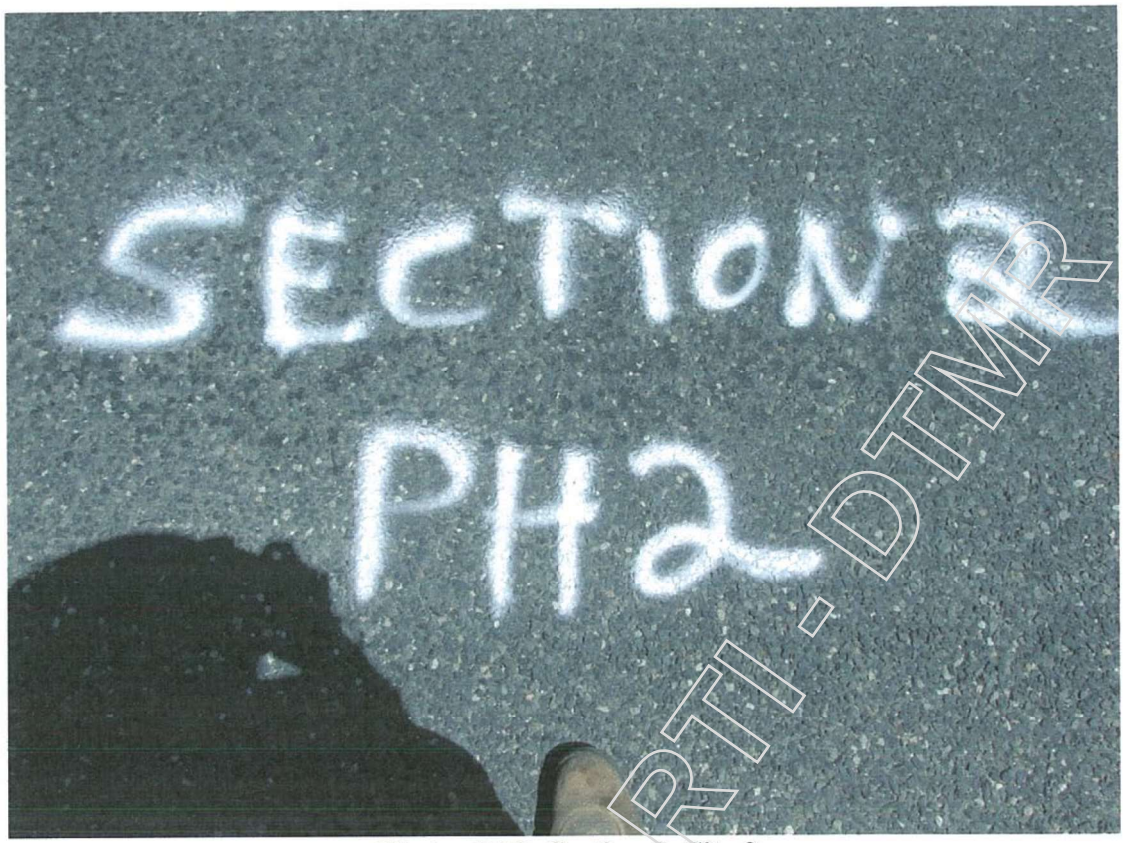


Photo A7-9: Section 2, Site 2

Photo A7-10: Section 2, Site 2 (LHS)

Photo A7-11: Section 2, Site 2 (RHS)

Photo A7-12: Section 2, Pothole 2

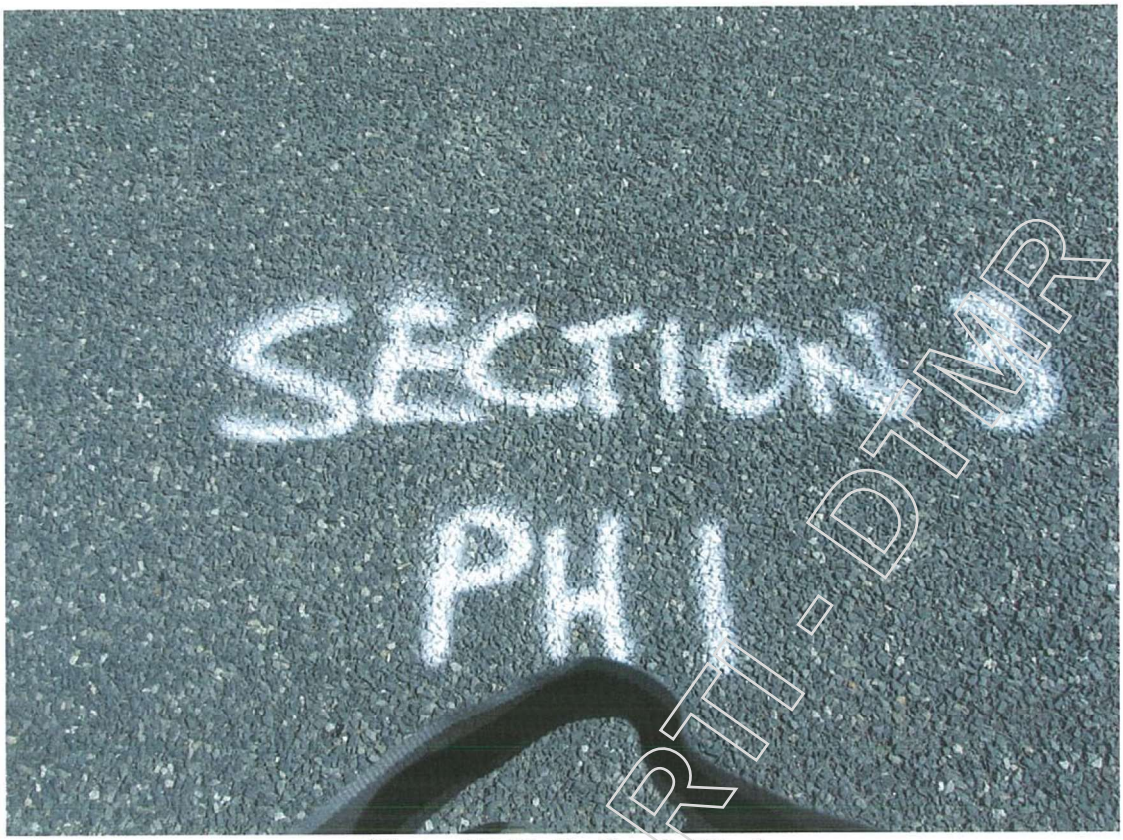


Photo A7-13: Section 3, Site 1

Photo A7-14: Section 3, Site 1 (LHS)

Photo A7-15: Section 3, Site 1 (RHS)

Photo A7-16: Section 3, Pothole 1

Photo A7-17: Section 3, Trench 1

Photo A7-18: Section 3, Trench 1 (LHS)

Photo A7-19: Section 3, Trench 1 (RHS)

Photo A7-20: Section 3, Trench 1

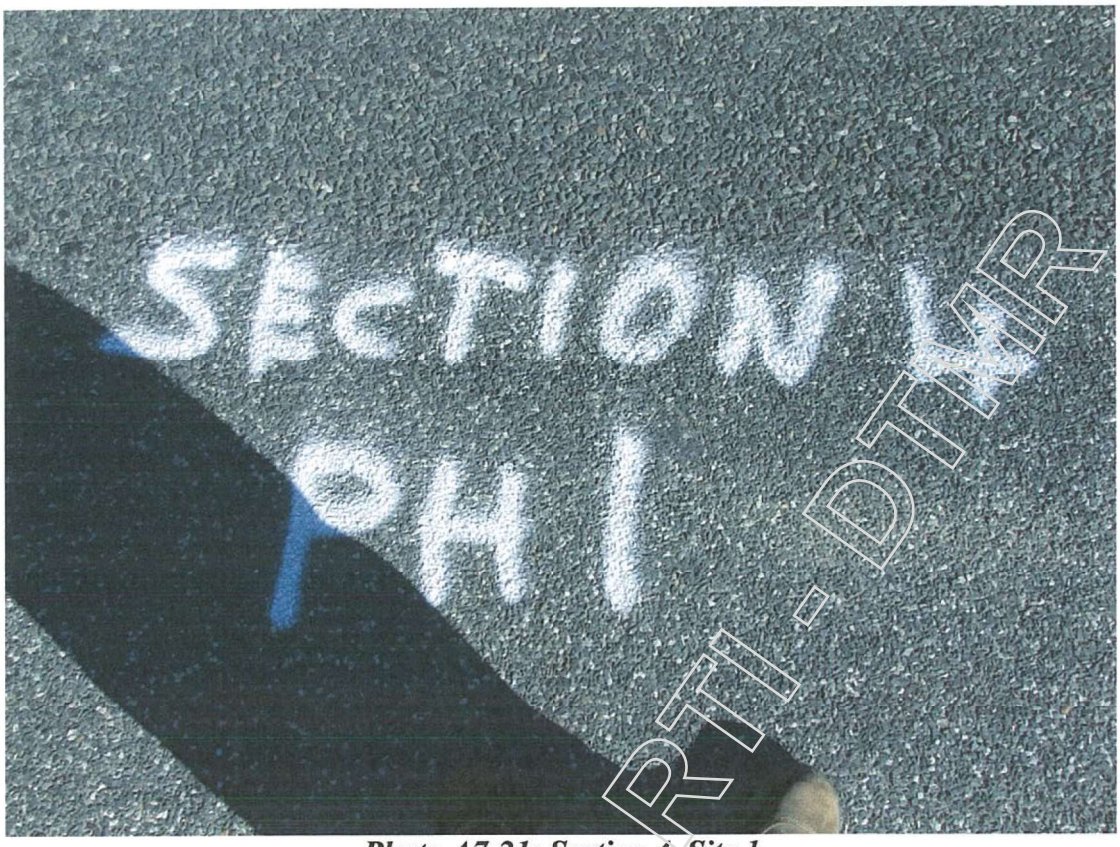


Photo A7-21: Section 4, Site 1

Photo A7-22: Section 4, Site 1 (LHS)

Photo A7-23: Section 4, Site 1 (RHS)

Photo A7-24: Section 4, Pothole 1

Photo A7-25: Section 4, Site 2

Photo A7-26: Section 4, Site 2 (LHS)

Photo A7-27: Section 4, Site 2 (RHS)

Photo A7-28: Section 4, Pothole 2

Photo A7-29: Section 5, Site 1

Photo A7-30: Section 5, Site 1 (RHS)

Photo A7-31: Section 5, Site 1 (LHS)

Photo A7-32: Section 5, Pothole 1

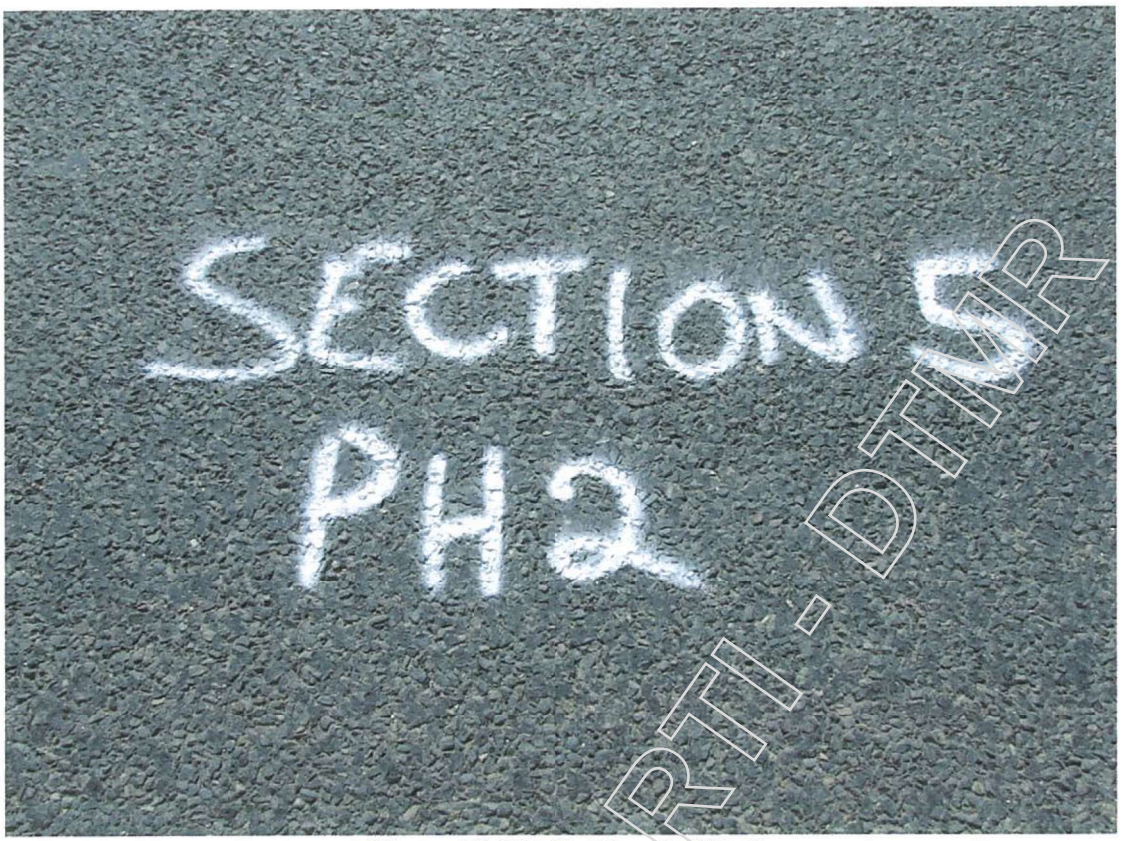


Photo A7-33: Section 5, Site 2

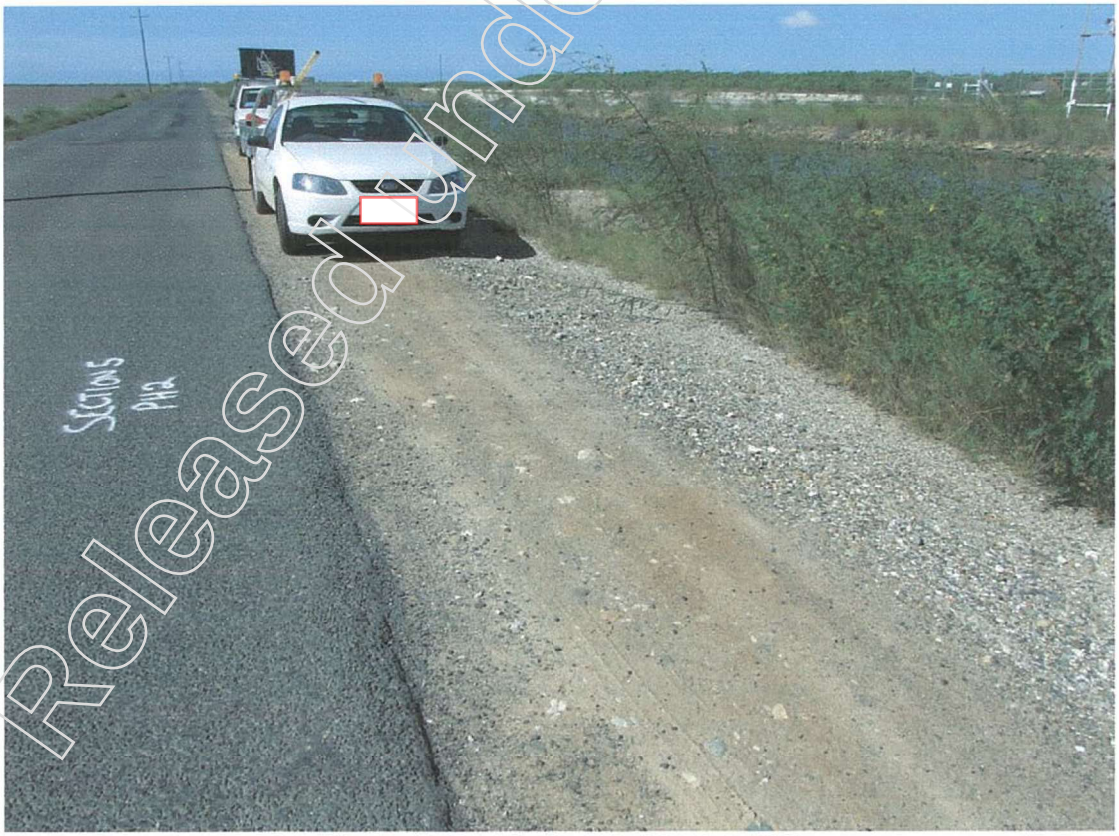


Photo A7-34: Section 5, Site 2 (RHS)

Photo A7-35: Section 5, Site 2 (LHS)

Photo A7-36: Section 5, Pothole 2

Photo A7-37: Section 6, Site 1

Photo A7-38: Section 6, Site 1 (RHS)

Photo A7-39: Section 6, Site 1 (LHS)

Photo A7-40: Section 6, Pothole 1

Photo A7-41: Section 6, Site 2

Photo A7-42: Section 6, Site 2 (LHS)

Photo A7-43: Section 6, Site 2 (RHS)

Photo A7-44: Section 6, Pothole 2

Appendix 8

Pavement Cross Sections

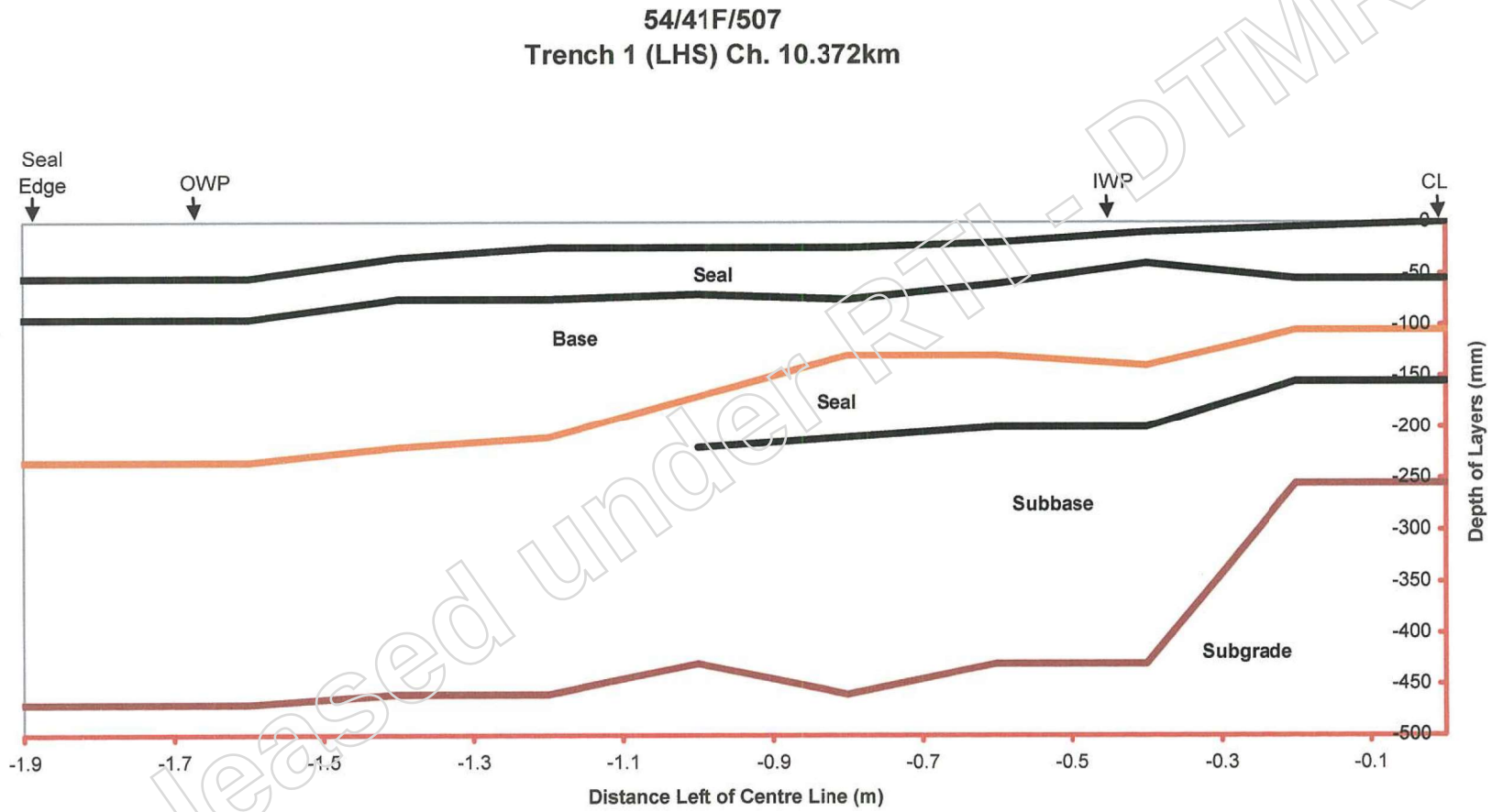


Figure A8-1: Section 3, Trench 1 Cross Section

Appendix C INVESTIGATION HOLE LOGS & INSITU CBR, PORT ALMA ROAD MAINTENANCE IMPROVEMENT REPORT, REPORT NO. 42542 (ISSUED IN FEBRUARY 2016)

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 1 Location: Ch. 26.480km, RHS OWP

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 ☐ Other:

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Seal**	35		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum ☐
No. of containers 4	**Base** Sandy Clayey Gravel, brown, poorly graded medium – coarse gravel, low plasticity clay fines, moist.	465		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum ☐
No. of containers 4	**Subgrade** Sandy Clayey Gravel, brown, poorly graded medium – coarse gravel, low - medium plasticity clay fines, moist.			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum ☐
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum ☐
No. of containers	NATA ACCREDITED FOR TECHNICAL COMPETENCE Accreditation Number: 2302 Accredited for compliance with ISO/IEC 17025			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum ☐

Remarks:

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42542 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

Materials Services (Rockhampton)
216 Richardson Road
North Rockhampton, Qld, 4701

Department of Transport and Main Roads

P 156794

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ABN: 57 836 727 711

MSF322

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Fax: (07) 4923 0750
www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK16W-0020-S01
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA TECHNICAL COMPETENCE

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S01
Tested By: Brendan Dodd
Material: Subgrade
Location: Pothole 1, Ch. 26.480km , RHS OWP
Date Tested: 18/01/2016

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Brown Sandy Clayey Gravel
Moisture Content: 5.3 %
Depth at Commencement of Test (mm): 500
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
500	550	50	0.0
550	675	125	38
675	815	140	15
815	889	74	32
889	1100	211	40
1100	1230	130	46
1230	1301	71	40

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 2 Location: Ch. 26.460km, 4.0m R of Seal Edge

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded medium – coarse gravel, low plasticity clay fines, moist. (Same as Pothole 1 Base)	580		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 4	**Subgrade** Gravelly Sand, brown, poorly graded fine – medium gravel, low plasticity clay fines, moist.			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	.			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	NATA Accreditation Number: 2302 Accredited for compliance with ISO/IEC 17025			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____

Remarks: _____

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42543 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

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www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK16W-0020-S02
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S02
Location: Pothole 2, Ch. 26.460km, 4.0m R of Seal Edge
Tested By: Brendan Dodd
Date Tested: 18/01/2016
Material: Subgrade

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Brown Gravelly Sand
Moisture Content: 3.0%
Depth at Commencement of Test (mm): 580
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
580	630	50	0.0
630	696	66	9.0
696	806	110	24
806	889	83	27
889	992	103	21
992	1195	203	15
1195	1395	200	11

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 3 Location: Ch. 26.240km, 4.0m R of Seal Edge

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded medium – coarse gravel, low plasticity clay fines, moist. (Same as Pothole 1 Base)	560		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subgrade** Sandy Clayey Gravel, brown, poorly graded medium – coarse gravel, low - medium plasticity clay fines, moist. (Same as Pothole 1 Subgrade)			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	NATA Accreditation Number: 2302 Accredited for compliance with ISO/IEC 17025			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____

Remarks: _____

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42544 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

Materials Services (Rockhampton)
216 Richardson Road
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ABN: 57 836 727 711

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www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK16W-0020-S03
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Matthew Wilson
(Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S03
Location: Pothole 3, Ch. 26.240km, 4.0m R of Seal Edge
Tested By: Brendan Dodd
Date Tested: 18/01/2016
Material: Subgrade

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Brown Sandy Clayey Gravel
Moisture Content: 12.2%
Depth at Commencement of Test (mm): 560
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
560	610	50	0.0
610	670	60	10.0
670	813	143	6.5
813	815	2	>60
815	972	157	3.0
972	1060	88	6.5
1060	1128	68	5.5
1128	1239	111	11
1239	1290	51	17
1290	1379	89	4.0

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 4 Location: Ch. 25.990km, RHS OWP

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Seal**	40		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 4	**Base** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist.	230		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	**Seal**	20		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 4	**Subbase** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist.	200		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 4	**Subgrade** Sandy Clay, brown, traces of medium gravel, medium plasticity clay fines, moist.			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____

NATA ACCREDITED FOR TECHNICAL COMPETENCE
Accreditation Number: 2302
Accredited for compliance with ISO/IEC 17025

Remarks:

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42545 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

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Insitu CBR

Report No: ICBR:ROK16W-0020-S04
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S04
Location: Pothole 4, Ch. 25.990km, RHS OWP
Tested By: Brendan Dodd
Date Tested: 18/01/2016
Material: Subgrade

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Brown Sandy Clay
Moisture Content: 17.2 %
Depth at Commencement of Test (mm): 480
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
0	50	50	0.0
50	102	52	12
102	340	238	15
340	426	86	9.0
426	490	64	29
490	577	87	20
577	644	67	36
644	698	54	20
698	816	118	14

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 5 Location: Ch. 25.990km, 2.0m R of Seal Edge

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel with cobbles at 100mm below, low - medium plasticity clay fines, moist. (Same as Pothole 4 Base)	230		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subbase** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist. (Same as Pothole 4 Subbase)	370		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subgrade** Marine Clay, high plasticity clay, wet.			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	NATA ACCREDITED FOR TECHNICAL COMPETENCE Accreditation Number: 2302 Accredited for compliance with ISO/IEC 17025			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____

Remarks:

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42548 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

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www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK16W-0020-S05
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA TECHNICAL COMPETENCE

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S05
Location: Pothole 5, Ch. 25.990km, 2.0m R of Seal Edge
Tested By: Brendan Dodd
Date Tested: 18/01/2016
Material: Subgrade

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Marine Clay
Moisture Content: 10.5%
Depth at Commencement of Test (mm): 640
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
640	690	50	0.0
690	796	106	14
796	870	74	17
870	933	63	9.5
933	1150	217	1.5
1150	1460	310	3.5

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 6 Location: Ch. 25.650km, RHS OWP

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Seal**	40		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist. (Same as Pothole 4 Base)	220		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subbase** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist. (Same as Pothole 4 Subbase)	230		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subgrade** Sandy Clay, brown, traces of medium gravel, medium plasticity clay fines, moist. (Same as Pothole 4 Subgrade)			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	NATA Accreditation Number: 2302 Accredited for compliance with ISO/IEC 17025			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____

Remarks: _____

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42546 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

Materials Services (Rockhampton)
216 Richardson Road
North Rockhampton, Qld, 4701

Department of Transport and Main Roads

Telephone: (07) 4923 0707
Facsimile: (07) 4923 0750
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ABN: 57 836 727 711

P156794

Queensland Government

Materials Services - Rockhampton
Department of Transport and Main Roads
216 Richardson Road, NORTH ROCKHAMPTON QLD 4701

Phone: (07) 4923 0711
Fax: (07) 4923 0750
www.tmr.qld.gov.au

Insitu CBR

Report No: ICBR:ROK16W-0020-S06
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA TECHNICAL COMPETENCE

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID:	ROK16W-0020-S06	**Location:**	Pothole 6, Ch. 25.650km, RHS OWP
Tested By:	Brendan Dodd	**Date Tested:**	18/01/2016
Material:	Subgrade		

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Sandy Clay	**Moisture Content:**	14.6%
Depth at Commencement of Test (mm):	660	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
660	710	50	0.0
710	786	76	14
786	1106	320	23
1106	1205	99	42
1205	1329	124	17
1329	1466	137	12

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 7 Location: Ch. 25.650km, 2.5m R of Seal Edge

Operator(s): B.J. Dodd Date: 18/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel with cobbles at 100mm below, low - medium plasticity clay fines, moist. (Same as Pothole 4 Base)	400		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subgrade** Marine Clay, high plasticity clay, wet (Same as Pothole 7 Subgrade)			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	NATA ACCREDITED FOR TECHNICAL COMPETENCE Accreditation Number: 2302 Accredited for compliance with ISO/IEC 17025			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____

Remarks: _____

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42547 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

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P156794

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Department of Transport and Main Roads
216 Richardson Road, NORTH ROCKHAMPTON QLD 4701

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Fax: (07) 4923 0750
www.tmr.qld.gov.au

Insitu CBR

Report No: ICBR:ROK16W-0020-S07
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA TECHNICAL COMPETENCE

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S07
Location: Pothole 7, Ch. 25.650km, 2.5m R of Seal Edge
Tested By: Brendan Dodd
Date Tested: 18/01/2016
Material: Subgrade

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Marine Clay
Moisture Content: 45.4 %
Depth at Commencement of Test (mm): 520
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
520	570	50	0.0
570	840	270	1.0
840	1026	186	1.5
1026	1329	303	2.5

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 8 Location: Ch. 25.320km, RHS OWP

Operator(s): B.J. Dodd Date: 19/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Seal**	40		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist. (Same as Pothole 4 Base)	300		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers	**Seal**	20		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subbase** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel, low - medium plasticity clay fines, moist. (Same as Pothole 4 Subbase)	180		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subgrade** Sandy Clay, brown, traces of medium gravel, medium plasticity clay fines, moist. (Same as Pothole 4 Subgrade)			e Content g Limits l multi / ☐ single point)atum _____ _____

NATA ACCREDITED FOR TECHNICAL COMPETENCE
Accreditation Number: 2302
Accredited for compliance with ISO/IEC 17025

Remarks:

Checked by: M.J. Wilson Date: 02/02/2016

Report No: 42549 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

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Queensland Government

Insitu CBR

Report No: ICBR:ROK16W-0020-S08
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Matthew Wilson
(Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID: ROK16W-0020-S08
Tested By: Brendan Dodd
Material: Subgrade
Location: Pothole 8, Ch. 25.320km, RHS OWP
Date Tested: 19/01/2016

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description: Brown Sandy Clay
Moisture Content: 13.9 %
Depth at Commencement of Test (mm): 600
Reference Point: Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
600	650	50	0.0
650	804	154	21
804	875	71	15
875	1040	165	20
1040	1245	205	21
1245	1411	166	27

Comments

SAMPLING REPORT - TEST PIT LOG

Queensland Government

Project No: 279/188/700 Project Name: Port Alma Road (Maintenance Improvement)

Site No: Pothole 9 Location: Ch. 25.320km, 3.0m R of Seal Edge

Operator(s): B.J. Dodd Date: 19/01/2016

Customer Details

Results to:	Mark Guymer				
Phone No.:	(07) 4931 1566	Mobile No.:	NR	Fax No.:	-
Postal Address:	31 Knight Street, North Rockhampton, Qld, 4701				
Charge/Order No:	279/188/700				

Test Method(s): ☑ AS1289.1.2.1 Clause: 6.5.4 . ☐ Other: .

Article Number / Container	Material Description	Layer Thickness	Layer Depth	Testing Required
No. of containers 0	**Base** Sandy Clayey Gravel, brown, poorly graded fine – medium gravel with cobbles at 100mm below, low - medium plasticity clay fines, moist. (Same as Pothole 4 Base)	500		☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers 0	**Subgrade** Marine Clay, high plasticity clay, wet (Same as Pothole 7 Subgrade)			☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				☐ Moisture Content ☐ Grading ☐ Atterberg Limits ☐ CBR ☐ multi / ☐ single point ☐ DCP Datum _____ ☐ _____
No. of containers				e Content g Limits multi / ☐ single point atum _____ _____

NATA ACCREDITED FOR TECHNICAL COMPETENCE
Accreditation Number: 2302
Accredited for compliance with ISO/IEC 17025

Remarks:

Checked by: M.J. Wilson Date: 02/02/2016 P156794.

Report No: 42550 Issued By: M.J. Wilson Signature: NR Date: 02/02/2016

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Queensland Government

Insitu CBR

Report No: ICBR:ROK16W-0020-S09
Issue No: 1

Client: TMR Rockhampton
31 Knight Street
North Rockhampton Qld 4701

Project: 279/188/700 - Port Alma Road (Maintenance)

Accredited for compliance with ISO/IEC 17025

NATA TECHNICAL COMPETENCE

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Matthew Wilson (Materials Technologist)
Date of Issue: 4/02/2016

Test Details

Sample ID:	ROK16W-0020-S09	**Location:**	Pothole 9, Ch. 25.320km, 3.0m R of Seal Edge
Tested By:	Brendan Dodd	**Date Tested:**	19/01/2016
Material:	Subgrade		

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Marine Clay	**Moisture Content:**	44.4 %
Depth at Commencement of Test (mm):	650	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR
650	700	50	0.0
700	898	198	1.5
898	1240	342	2.5
1240	1465	225	3.0

Comments

John Sullivan
493 11573

Job. 279/188/700.

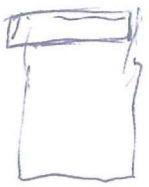
9 potholes.

Excavate .500 ~~mm~~ m Sample for Grading, Atts, CBR.

Remove Seal and Base (≈ 150mm)

Do DCP to ≈ 1m. (ignore refusal rules).

Sample down to .5m.



Appendix D BAJOOL – PORT ALMA ROAD CH.19.7KM – 25.3KM PAVEMENT INVESTIGATION REPORT, REPORT NO. 07/18 (ISSUED IN JULY 2018)

Pavement Investigation

Bajool – Port Alma Road (188)
Ch. 19.7km – 25.3km
Client: Program Delivery and Operations (Fitzroy District)
Date Issued: July 2018
Report No.: 7/18
Author: B.J. Dodd

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1	Introduction
2	Location
3	Sampling
4	Pavement Sampling and Testing
5	Subgrade Sampling and Testing
6	Local Influences

Appendix

1	Investigation Brief
2	Summary of Results
3	Insitu CBR (DCP) Reports
4	Pavement Reports
5	Subgrade Reports
6	Site Photographs

List of Tables, Photographs and Figures

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Table 2-2	Summary of Testing (Pothole Ch. 21.61km 2.2-4.9m R of C/Line)	Appendix 2
Table 2-3	Summary of Testing (Pothole Ch. 23.32km 2.0-5.2m R of C/Line)	Appendix 2
Table 2-4	Summary of Testing (Pothole Ch. 24.38km 2.2-5.6m R of C/Line)	Appendix 2
Table 2-5	Summary of Testing (Pothole Ch. 25.22km 2.2-5.4m R of C/Line)	Appendix 2
Photo A6-1-8	Pothole Ch. 20.01km 1.6-5.1m R of C/Line	Appendix 6
Photo A6-9-16	Pothole Ch. 21.61km 2.2-4.9m R of C/Line	Appendix 6
Photo A6-17-23	Pothole Ch. 23.32km 2.0-5.2m R of C/Line	Appendix 6
Photo A6-24-30	Pothole Ch. 24.38km 2.2-5.6m R of C/Line	Appendix 6
Photo A6-31-37	Pothole Ch. 25.22km 2.2-5.4m R of C/Line	Appendix 6

1. Introduction

A pavement investigation involving the sampling and testing of pavement and subgrade materials, was conducted by the Rockhampton Materials Services Unit on the Bajool – Port Alma Road (188) starting on 12th June 2018.

2. Location

The investigation consisted of 5 potholes, conducted on the Bajool – Port Alma Road (188), Ch. 19.7km – 25.3km. All distance measurements are through distances based on the Transport and Main Roads reference point system and are shown in kilometres unless otherwise stated. The sampling locations were nominated by the client.

All offset measurements are in metres and are referenced to the existing centreline (CL) unless otherwise stated. All depth measurements were taken from the surface level unless otherwise stated.

For the purpose of this report the term subgrade includes all material below the pavement layers.

3. Sampling

Assistant Materials Officer N.J. Page and Technical Support Officer T.W. Daley from the Rockhampton Laboratory performed the sampling on the 12th and 13th June 2018. Disturbed samples of the pavement and subgrade materials were taken from each location using a mini-excavator. The sampling method used is shown on the test reports. Photographs of the sites are shown in *Appendix 6.*

The sample descriptions included in *Appendix 2* are based on the system used in AS 1726-2017 "Geotechnical Site Investigations", *Appendix A*. Where the classification group symbol is shown in brackets the classification is based on field observation. Where the classification symbol is shown without brackets the classification is based on observations and confirmed by laboratory testing.

4. Pavement Sampling and Testing

Disturbed samples of the base and subbase materials were taken from the pavement at each of the nominated locations. Representative samples of each variation in material were tested for grading, liquid limit, plastic limit, linear shrinkage and single point CBR (100% STD). The test results are summarised in *Appendix 2,* copies of the test reports are included in *Appendix 4.*

5. Subgrade Sampling and Testing

Disturbed samples of the subgrade materials were taken at each of the nominated locations and tested for grading, liquid limit, plastic limit, linear shrinkage, single point CBR (97% STD), moisture content and insitu CBR (DCP)). The test results are summarised in *Appendix 2,* copies of the insitu CBR reports are included in *Appendix 3,* and copies of the laboratory test reports are included in *Appendix 5.*

6. Local Influences

During sampling, notes were kept on the local influences at each location. These notes are summarised in Appendix 2.

APPENDIX 1: INVESTIGATION BRIEF

Request for Field Investigation, Sampling and Data Collection Services

Road: 188
Job No. 02790188200
Location: Port Alma Road

Proposed Works: Widen seal with minimum pavement design and trench install PUP Ergon under existing road/shoulder to increase seal with. Chainage 7km to road end WBS. 02790188200.C.DE.2

1. Scope of Services Requested

With regard to the above project, it is requested that the following services, as detailed in the 'Standard Brief for Field Investigation, Sampling and Data Collection', be carried out and reported:

- Trenching or Potholing
- Field Notes / Insitu Testing – (a), (b), (c) & (d)
- Road Pavement Sampling
- Shoulder Pavement Sampling
- Subgrade Sampling
- Other:_Field Observation notes are required for formation below Subgrade level and above salt pan for layers, material type and where, what level & if rock exists on top of the salt pan._____

2. Sampling Locations

The locations for trenching, field investigation and sampling have been marked on the bitumen seal edge as per the following table.

Road Marking				Side of Road	'New Shoulder Point' offsets from Centreline	
No.	Offset	Chainage	Comments		Left	Right
Previous Report 08/08 (54/41F/507) has been supplied Chainage 4.7 – 19.7km						
As determined onsite between Chainage 19.7km – 25.3km						
Project Scope is to trench Ergon power lines in road and then widen pavement and seal to achieve maximum width available. Sample shoulders where possible to achieve this.						
Please note where marine vegetation is on road shoulders do not disturb.						

Should you require any further information, please don't hesitate to contact me.

Signed_____ NR Date__29/05/2018_____

Position___Principal Engineer_____ Phone No. _49311614_____

Standard Brief for Field Investigation, Sampling and Data Collection Services

1a. Trenches

i. Locations – as per the 'Field Investigation and Sampling Request'
ii. Extent – from centreline through shoulder to daylight or 'new shoulder point'
iii. Depth – top 300mm of the subgrade

Or

1b. Potholes

i. Locations – as per the 'Field Investigation and Sampling Request'
ii. Depth – top 300mm of the subgrade & below subgrade level to sample formation material type and observations & determination if rock exists and at what level below road surface

2. Field Notes / Insitu Testing

(a) Local Influences Description

i. Formation (good, below surround ground levels, in cutting, high fill etc.)
ii. Pavement deformation (rutting, depressions, shoving etc.)
iii. Wearing surface width (seal edge to centreline) and condition (describe any shoving, corrugations, cracking, potholes etc)
iv. Tabledrain condition (well maintained, filled up, none etc. and approximate distance from edge of seal and depth)

(b) Road Pavement and Shoulder Configurations

i. Pavement configuration sketches at each trench
ii. Photographs at each site

(c) Subgrade

i. D.C.P's – 3 per trench or 1 per pothole (to 500- 1000mm below subgrade level or to refusal)
ii. Note any perched water tables
iii. Field assessment of rippability of any rock encountered

3. Road Pavement Sampling

Obtain sufficient sample materials to carry out the following laboratory testing for each different pavement layer:

i. CBR (soaked, single point, @ OMC and 100% STD compaction)
ii. Grading
iii. Atterberg Limits
iv. UCS
v. Any additional testing that may be deemed relevant

4. Shoulder Pavement Sampling

Obtain sufficient sample materials to carry out the following laboratory testing for each different pavement layer:

i. CBR (soaked, single point, @ OMC and 100% STD compaction)
ii. Grading
iii. Atterberg Limits

iv. UCS
v. Any additional testing that may be deemed relevant

5. Subgrade

Obtain sufficient sample materials to carry out the following laboratory testing:

i. CBR (soaked, single point, @ OMC and 97% STD compaction)
ii. Grading
iii. Atterberg Limits
iv. Insitu Moisture Content (at each location where the D.C.P was performed)
v. Any additional testing that may be deemed relevant

APPENDIX 2: SUMMARY OF RESULTS

Site	Pothole
Location	Ch. 20.01km (RHS)

Site Conditions	
Seal Condition	Flushing
Pavement Deformation	Potholing near C/Line
Tabledrain Condition	Maintained

Wearing Surface

Article No.	Offset	Avg. Thickness (mm)
-	1.6-3.3m R of CL	10

Base 1

Article No.	Offset	Avg. Thickness (mm)	CBR (Cond)	OMC	PI	LS	PI x .425	LS x .425
ROK18W-0016-S01	1.6-2.6m R of CL	250	56 (Skd)	10.9	3.4	3.0	73	65
Description	GP-GM, SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty fines, brown, moist							

Shoulder Base

Article No.	Offset	Avg. Thickness (mm)	CBR (Cond)	OMC	PI	LS	PI x .425	LS x .425
ROK18W-0016-S02	2.6-5.1m R of CL	200	40 (Skd)	7.8	5.4	3.4	203	128
Description	GM-GC, SILTY CLAYEY SANDY GRAVEL, poorly graded gravel to 37.5mm with fine to coarse grained sand with low plasticity silty clay fines, brown, moist							

Subbase 1

Article No.	Offset	Avg. Thickness (mm)	CBR (Cond)	OMC	PI	LS	PI x .425	LS x .425
ROK18W-0016-S03	1.6-2.7m R of CL	250	70 (Skd)	7.8	5.0	3.2	106	68
Description	GM-GC, CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, brown, moist							

Subbase 2 (Shoulder)

Article No.	Offset	Avg. Thickness (mm)	CBR (Cond)	OMC	PI	LS	PI x .425	LS x .425
ROK18W-0016-S04	2.7-5.1m R of CL	200	15 (Skd)	10.9	7.8	4.2	313	168
Description	GM-GC, CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, light brown, moist							

Subgrade

Article No.	Offset	Avg. Thickness (mm)	CBR (Cond)	OMC	PI	LS	PI x .425	LS x .425
ROK18W-0016-S05	1.6-2.7m R of CL	N/A	9.0 (Skd)	14.7	6.8	3.8	396	221
Description	GM, SILTY SAND AND GRAVEL, poorly graded gravel to 53.0mm, fine to coarse grained sand with low plasticity silt fines, brown black, moist							

Subgrade								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
ROK18W-0016-S06	2.7-5.1m R of CL	N/A	8.0 (Skd)	13.9	8.8	4.4	487	244
Description	GM, SILTY SAND AND GRAVEL, poorly graded gravel to 75.0mm, fine to coarse grained sand with low plasticity silt fines, brown, moist							
Insitu CBR (DCP)								
Article No.	ROK18W-0016-S10							
Offset	2.3m R of C/Line							
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**				
610	966	356	9.5	20.5				
966	1020	54	3.0					
1020	1140	120	29					
1140	1263	123	21					
Article No.	ROK18W-0016-S11							
Offset	3.8m R of C/Line							
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**				
450	686	236	19	16.9				
686	810	124	46					
810	847	37	17					
847	1395	548	11					

Table 2-1: Summary of Testing (Pothole Ch. 20.01km 1.6-5.1m R of C/Line)

Note: Samples with results shown in brackets were not tested; the results shown are of tests carried out on a sample visually assessed as consistent with that sample.
Refer to Appendix 7 – Trench Profile, for layer depths.

Site	Pothole							
Location	Ch. 21.61km (RHS)							
Site Conditions								
Seal Condition	flushing IWP and OWP both LHS and RHS							
Pavement Deformation	rutting near C/Line							
Tabledrain Condition	grassed							
Wearing Surface								
Article No.	**Offset**	**Avg. Thickness (mm)**						
-	2.2-3.6m R of CL	10						
Base 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0391	2.2-3.6m R of CL	200	(56) (Skd)	(10.9)	(3.4)	(3.0)	(73)	(65)
Description	(GP-GM), SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty fines, brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Base 1 ROK18W-0016-S01**							
Shoulder Base								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
ROK18W-0016-S07	3.6-4.9m R of CL	130	20 (Skd)	11.1	5.0	3.4	202	137
Description	GM. SILTY SAND AND GRAVEL, poorly graded gravel to 53.0mm, fine to coarse grained sand with medium plasticity silt fines, light brown, moist							
Subbase 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0394	2.2-3.6m R of CL	200	(70) (Skd)	(7.8)	(5.0)	(3.2)	(106)	(68)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 1 ROK18W-0016-S03**							
Subbase 2 (Shoulder)								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0395	3.6-4.9m R of CL	180	(15) (Skd)	(10.9)	(7.8)	(4.2)	(313)	(168)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase (Shoulder) ROK18W-0016-S04**							

Subgrade								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
ROK18W-0016-S08	2.2-4.9m R of CL	N/A	15 (Skd)	13.0	7.4	2.8	391	148
Description	GM, SILTY SAND AND GRAVEL, poorly graded gravel to 75.0mm, fine to coarse grained sand with low plasticity silt fines, brown black, moist							

Insitu CBR (DCP)				
Article No.	ROK18W-0016-S12			
Offset	3.1m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
810	900	90	22	18.3
900	999	99	7.5	
999	1066	67	40	
1066	1100	34	12	
1100	1210	110	7.0	
1210	1770	560	5.0	
Article No.	ROK18W-0016-S13			
Offset	3.8m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
730	808	78	2.0	35.8
808	1000	192	3.5	
1000	1283	283	5.0	
1283	1706	423	4.0	

Table 2-2: Summary of Testing (Pothole Ch. 21.61km 2.2-4.9m R of C/Line)

Note: Samples with results shown in brackets were not tested; the results shown are of tests carried out on a sample visually assessed as consistent with that sample.
Refer to Appendix 7 – Trench Profile, for layer depths.

Site	Pothole							
Location	Ch. 23.32km (RHS)							
Site Conditions								
Seal Condition	slight flushing							
Pavement Deformation	rutting IWP and OWP							
Tabledrain Condition	grassed, vegetated							
Wearing Surface								
Article No.	**Offset**	**Avg. Thickness (mm)**						
-	2.0-3.6m R of CL	10						
Base 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0399	2.0-3.6m R of CL	250	(56) (Skd)	(10.9)	(3.4)	(3.0)	(73)	(65)
Description	(GP-GM), SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty fines, brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Base 1 ROK18W-0016-S01**							
Subbase 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0400	2.0-3.6m R of CL	300	(70) (Skd)	(7.8)	(5.0)	(3.2)	(106)	(68)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 1 ROK18W-0016-S03**							
Top Soil								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0401	3.6-5.2m R of CL	100	- (Skd)	-	-	-	-	-
Description	no sample taken							
Shoulder Base								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0402	3.6-5.2m R of CL	150	(20) (Skd)	(11.1)	(5.0)	(3.4)	(202)	(137)
Description	(GM), SILTY SAND AND GRAVEL, poorly graded gravel to 53.0mm, fine to coarse grained sand with medium plasticity silt fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 21.61km Shoulder Base ROK18W-0016-S07**							

Subbase 2 Shoulder								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0403	3.6-5.2m R of CL	200	(15) (Skd)	(10.9)	(7.8)	(4.2)	(313)	(168)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 2 Shoulder ROK18W-0016-S04**							
Subgrade								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
ROK18W-0016-S09	2.0-5.2m R of CL	N/A	9.0 (Skd)	14.1	6.2	3.4	277	152
Description	GM, SILTY SAND AND GRAVEL, poorly graded gravel with cobbles, fine to coarse grained sand with low plasticity silt fines, brown, moist							

Insitu CBR (DCP)				
Article No.	ROK18W-0016-S14			
Offset	2.8m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
650	691	41	21	14.9
691	833	142	36	
833	870	37	24	
870	905	35	11	
905	961	56	6.5	
961	1095	134	27	
1095	1131	36	11	
1131	1285	154	4.5	
1285	1565	280	6.0	
Article No.	ROK18W-0016-S15			
Offset	3.8m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
550	690	140	6.5	6.9
690	769	79	4.5	
769	930	61	2.5	
830	1054	224	1.5	
1054	1219	165	2.0	
1219	1464	245	4.5	

Table 2-3: Summary of Testing (Pothole Ch. 23.32km 2.0-5.2m R of C/Line)

Note: Samples with results shown in brackets were not tested; the results shown are of tests carried out on a sample visually assessed as consistent with that sample.
Refer to Appendix 7 – Trench Profile, for layer depths.

Site	Pothole							
Location	Ch. 24.38km (RHS)							
Site Conditions								
Seal Condition	cracking near C/Line and shoulder, flushing IWP both LHS and RHS							
Pavement Deformation	good							
Tabledrain Condition	grassed, vegetated							
Wearing Surface								
Article No.	**Offset**	**Avg. Thickness (mm)**						
-	2.2-3.8m R of CL	15						
Base 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0413	2.2-3.8m R of CL	200	(56) (Skd)	(10.9)	(3.4)	(3.0)	(73)	(65)
Description	(GP-GM), SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty fines, brown, moist, **stabilised** **Visually assessed as being the same as Pothole Ch. 20.01km Base 1 ROK18W-0016-S01**							
Subbase 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0414	2.2-3.8m R of CL	180	(70) (Skd)	(7.8)	(5.0)	(3.2)	(106)	(68)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 1 ROK18W-0016-S03**							
Top Soil								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0415	3.8-5.6m R of CL	60	- (Skd)	-	-	-	-	-
Description	no sample taken							
Shoulder Base								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0416	3.8-5.6m R of CL	100	(20) (Skd)	(11.1)	(5.0)	(3.4)	(202)	(137)
Description	(GM), SILTY SAND AND GRAVEL, poorly graded gravel to 53.0mm, fine to coarse grained sand with medium plasticity silt fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 21.61km Shoulder Base ROK18W-0016-S07**							

Subbase 2 Shoulder								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0417	3.8-5.6m R of CL	240	(15) (Skd)	(10.9)	(7.8)	(4.2)	(313)	(168)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 2 Shoulder ROK18W-0016-S04**							
Subgrade								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
ROK18W-0016-S16	2.2-5.6m R of CL	N/A	23 (Skd)	14.1	6.2	3.4	277	152
Description	GM, SILTY SAND AND GRAVEL, poorly graded gravel with cobbles, fine to coarse grained sand with low plasticity silt fines, brown, moist							

Insitu CBR (DCP)				
Article No.	ROK18W-0016-S17			
Offset	3.1m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
520	646	126	27	10.5
646	716	70	54	
716	789	73	>60	
789	831	42	>60	
831	983	152	36	
983	1445	462	7.5	
Article No.	ROK18W-0016-S15			
Offset	3.8m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
510	823	313	2.0	41.1
823	1090	267	3.0	
1090	1405	315	4.0	

Table 2-4: Summary of Testing (Pothole Ch. 24.38km 2.0-5.2m R of C/Line)

Note: Samples with results shown in brackets were not tested; the results shown are of tests carried out on a sample visually assessed as consistent with that sample.
Refer to Appendix 7 – Trench Profile for layer depths.

Site	Pothole							
Location	Ch. 25.22km (RHS)							
Site Conditions								
Seal Condition	cracking near C/Line and shoulder, flushing IWP both LHS and RHS							
Pavement Deformation	good							
Tabledrain Condition	grassed, vegetated							
Wearing Surface								
Article No.	**Offset**	**Avg. Thickness (mm)**						
-	2.2-4.0m R of CL	10						
Base 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0423	2.2-4.0m R of CL	200	(56) (Skd)	(10.9)	(3.4)	(3.0)	(73)	(65)
Description	(GP-GM), SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty fines, brown, moist, **stabilised** **Visually assessed as being the same as Pothole Ch. 20.01km Base 1 ROK18W-0016-S01**							
Subbase 1								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0424	2.2-4.0m R of CL	190	(70) (Skd)	(7.8)	(5.0)	(3.2)	(106)	(68)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 1 ROK18W-0016-S03**							
Top Soil								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0425	4.0-5.4m R of CL	70	- (Skd)	-	-	-	-	-
Description	no sample taken							
Shoulder Base								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0426	4.0-5.4m R of CL	150	(20) (Skd)	(11.1)	(5.0)	(3.4)	(202)	(137)
Description	(GM), SILTY SAND AND GRAVEL, poorly graded gravel to 53.0mm, fine to coarse grained sand with medium plasticity silt fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 21.61km Shoulder Base ROK18W-0016-S07**							

Subbase 2 Shoulder								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
RH18-0427	4.0-5.4m R of CL	150	(15) (Skd)	(10.9)	(7.8)	(4.2)	(313)	(168)
Description	(GM-GC), CLAYEY SILTY SANDY GRAVEL, poorly graded gravel to 37.5mm, fine to coarse grained sand with low plasticity silty clay fines, light brown, moist **Visually assessed as being the same as Pothole Ch. 20.01km Subbase 2 Shoulder ROK18W-0016-S04**							
Subgrade								
Article No.	**Offset**	**Avg. Thickness (mm)**	**CBR (Cond)**	**OMC**	**PI**	**LS**	**PI x .425**	**LS x .425**
ROK18W-0016-S19	2.2-5.4m R of CL	N/A	11 (Skd)	13.0	6.2	3.0	334	162
Description	GM, SILTY SAND AND GRAVEL, poorly graded gravel with cobbles, fine to coarse grained sand with low plasticity silt fines, brown, moist							

Insitu CBR (DCP)				
Article No.	ROK18W-0016-S20			
Offset	2.8m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
480	656	176	40	13.7
656	796	140	34	
796	911	115	>60	
911	982	71	22	
982	1067	85	12	
1067	1125	58	6.5	
1125	1186	61	13	
1186	1279	93	18	
1279	1386	107	7.0	
Article No.	ROK18W-0016-S21			
Offset	4.6m R of C/Line			
Start Depth (mm)	**End Depth (mm)**	**Thickness (mm)**	**Insitu CBR**	**Moisture Content**
420	458	38	4.5	13.7
458	956	498	1.5	
956	1174	218	4.0	
1174	1343	169	6.5	

Table 2-5: Summary of Testing (Pothole Ch. 25.22km 2.0-5.2m R of C/Line)

Note: Samples with results shown in brackets were not tested; the results shown are of tests carried out on a sample visually assessed as consistent with that sample.
Refer to Appendix 7 – Trench Profile, for layer depths.

APPENDIX 3: INSITU CBR (DCP) REPORTS

Materials Services - Rockhampton
Department of Transport and Main Roads
216 Richardson Road, NORTH ROCKHAMPTON QLD 4701

Phone: (07) 4923 0711
Fax: (07) 4923 0750
www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S10
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S10	**Location:**	Ch 20.01km, 2.3m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	12/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	20.5
Depth at Commencement of Test (mm):	560	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
560	610	50	0.0	
610	966	356	9.5	
966	1020	54	3.0	
1020	1140	120	29	
1140	1263	123	21	

Comments

Materials Services - Rockhampton
Department of Transport and Main Roads
216 Richardson Road, NORTH ROCKHAMPTON QLD 4701

Phone: (07) 4923 0711
Fax: (07) 4923 0750
www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S11
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S11	**Location:**	Ch 20.01km, 3.8m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	12/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	16.9
Depth at Commencement of Test (mm):	400	**Reference Point:**	Top of Formation

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
400	450	50	0.0	
450	686	236	19	
686	810	124	46	
810	847	37	17	
847	1395	548	11	

Comments

Materials Services - Rockhampton
Department of Transport and Main Roads
216 Richardson Road, NORTH ROCKHAMPTON QLD 4701

Phone: (07) 4923 0711
Fax: (07) 4923 0750
www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S12
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Test Details

Sample ID:	ROK18W-0016-S12	**Location:**	Ch 21.61km, 3.1m R of Centre Line
Tested By:	Brendan Dodd	**Date Tested:**	12/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	18.3
Depth at Commencement of Test (mm):	760	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
760	810	50	0.0	
810	900	90	22	
900	999	99	7.5	
999	1066	67	40	
1066	1100	34	12	
1100	1210	110	7.0	
1210	1770	560	5.0	

Comments

Materials Services - Rockhampton
Department of Transport and Main Roads
216 Richardson Road, NORTH ROCKHAMPTON QLD 4701

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Fax: (07) 4923 0750
www.tmr.qld.gov.au

Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S13
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd
(Materials Technologist)
Date of Issue: 9/07/2018

Test Details

Sample ID:	ROK18W-0016-S13	**Location:**	Ch 21.61km, 4.3m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	12/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	35.8
Depth at Commencement of Test (mm):	680	**Reference Point:**	Top of Formation

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
680	730	50	0.0	
730	808	78	2.0	
808	1000	192	3.5	
1000	1283	283	5.0	
1283	1706	423	4.0	

Comments

Materials Services - Rockhampton
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Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S14
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S14	**Location:**	Ch 23.32km, 2.8m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	12/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	14.9
Depth at Commencement of Test (mm):	600	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
600	650	50	0.0	
650	691	41	21	
691	833	142	36	
833	870	37	24	
870	905	35	11	
905	961	56	6.5	
961	1095	134	27	
1095	1131	36	11	
1131	1285	154	4.5	
1285	1565	280	6.0	

Comments

Materials Services - Rockhampton
Department of Transport and Main Roads
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Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S15
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S15	**Location:**	Ch 23.32km, 4.8m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	12/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	6.9
Depth at Commencement of Test (mm):	500	**Reference Point:**	Top of Formation

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
500	550	50	0.0	
550	690	140	6.5	
690	769	79	4.5	
769	830	61	2.5	
830	1054	224	1.5	
1054	1219	165	2.0	
1219	1464	245	4.5	

Comments

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Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S17
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S17	**Location:**	Ch 24.38km, 3.1m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	13/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	10.5
Depth at Commencement of Test (mm):	470	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
470	520	50	0.0	
520	646	126	27	
646	716	70	54	
716	789	73	>60	
789	831	42	>60	
831	983	152	36	
983	1445	462	7.5	

Comments

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Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S18
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S18	**Location:**	Ch 24.38km, 4.8m R of Centre Line
Tested By:	Brendan Dodd	**Date Tested:**	13/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	41.1
Depth at Commencement of Test (mm):	460	**Reference Point:**	Top of Formation

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
460	510	50	0.0	
510	823	313	2.0	
823	1090	267	3.0	
1090	1405	315	4.0	

Comments

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Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S20
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S20	**Location:**	Ch 25.22km, 2.8m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	13/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Gravel	**Moisture Content (%):**	13.7
Depth at Commencement of Test (mm):	430	**Reference Point:**	Top of Seal

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
430	480	50	0.0	
480	656	176	40	
656	796	140	34	
796	911	115	>60	
911	982	71	22	
982	1067	85	12	
1067	1125	58	6.5	
1125	1186	61	13	
1186	1279	93	18	
1279	1386	107	7.0	

Comments

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Queensland Government

Insitu CBR

Report No: ICBR:ROK18W-0016-S21
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 4/07/2018

Test Details

Sample ID:	ROK18W-0016-S21	**Location:**	Ch 25.22km, 4.6m R of Centre Line
Tested By:	Nathan Page	**Date Tested:**	13/06/2018
Material:	Subgrade	**Specification:**	Investigation 'Subgrade'

Test Results

Insitu California Bearing Ratio (Dynamic Cone Penetrometer) [Q114B]

Soil Description:	Brown Silty Sand and Clay	**Moisture Content (%):**	13.7
Depth at Commencement of Test (mm):	370	**Reference Point:**	Top of Formation

Soil Layers

Start Depth (mm)	End Depth (mm)	Thickness (mm)	Insitu CBR	Description
370	420	50	0.0	
420	458	38	4.5	
458	956	498	1.5	
956	1174	218	4.0	
1174	1343	169	6.5	

Comments

APPENDIX 4: PAVEMENT REPORTS

Queensland Government

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Phone: (07) 4923 0711
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Materials Test Report

Report No: MAT:ROK18W-0016-S01
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S01
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Base
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	Ch 20.01km
Chainage:	1.6-2.6m R of Centre Line
Offset:	Ch 20.01km

Other Test Results

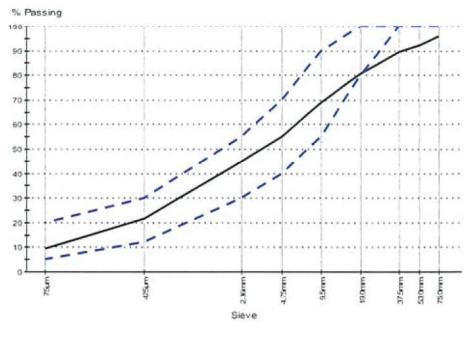
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		6.9	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.0	≤3.5
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	32.2	
Plastic Limit (%)	Q105	28.8	
Plasticity Index (%)	Q105	3.4	≤6
Weighted Plasticity Index (%)	Q105	73	≤150
Weighted Linear Shrinkage (%)	Q106	65	≤85
Sample History		Oven -dried	
Date Tested		25/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		56	
CBR at 2.5 (%)		40	
CBR at 5.0 (%)		56	
Target Dry Density (t/m³)		1.982	
Nominated Relative Compaction (%)		100.0	
Target Moisture Content (%)		10.9	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.99	
Achieved Relative Compaction (%)		100.1	
Achieved Moisture Content (%)		10.7	
Achieved % OMC		98.5	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		-0.1	
MC After Penetration of Remainder(%)		10.7	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
75.0mm	96	100
53.0mm	92	100
37.5mm	90	100
19.0mm	81	80 – 100
9.5mm	69	55 – 90
4.75mm	55	40 – 70
2.36mm	45	30 – 55
425µm	22	12 – 30
75µm	9.4	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 16014g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S01
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S01
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Base
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	Ch 20.01km
Chainage:	1.6-2.6m R of Centre Line
Offset:	Ch 20.01km

Other Test Results

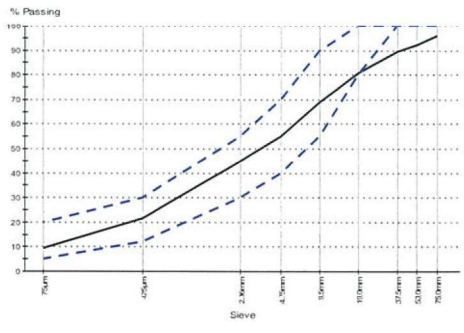
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		10.8	
Date Tested		29/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.98	
Standard OMC (%)		11.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		27/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
75.0mm	96	100
53.0mm	92	100
37.5mm	90	100
19.0mm	81	80 – 100
9.5mm	69	55 – 90
4.75mm	55	40 – 70
2.36mm	45	30 – 55
425µm	22	12 – 30
75µm	9.4	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 16014g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Queensland Government

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Materials Test Report

Report No: MAT:ROK18W-0016-S02
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025 - Testing

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S02
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Shoulder Base
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	2.6-5.1m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

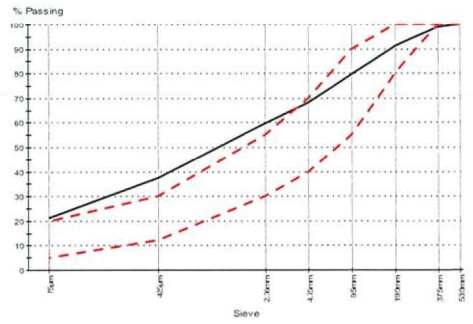
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		5.8	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.4	≤3.5
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	26.4	
Plastic Limit (%)	Q105	21.0	
Plasticity Index (%)	Q105	5.4	≤6
Weighted Plasticity Index (%)	Q105	203	≤150
Weighted Linear Shrinkage (%)	Q106	128	≤85
Sample History		Oven -dried	
Date Tested		21/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		40	
CBR at 2.5 (%)		40	
CBR at 5.0 (%)		40	
Target Dry Density (t/m³)		2.119	
Nominated Relative Compaction (%)		100.0	
Target Moisture Content (%)		7.8	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		2.12	
Achieved Relative Compaction (%)		99.8	
Achieved Moisture Content (%)		8.0	
Achieved % OMC		102.5	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		0.0	
MC After Penetration of Remainder(%)		9.5	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	100
37.5mm	99	100
19.0mm	91	80 – 100
9.5mm	80	55 – 90
4.75mm	68	40 – 70
2.36mm	60	30 – 55
425µm	38	12 – 30
75µm	21	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 17667g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Queensland Government

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Department of Transport and Main Roads
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Materials Test Report

Report No: MAT:ROK18W-0016-S02
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S02
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Shoulder Base
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	2.6-5.1m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

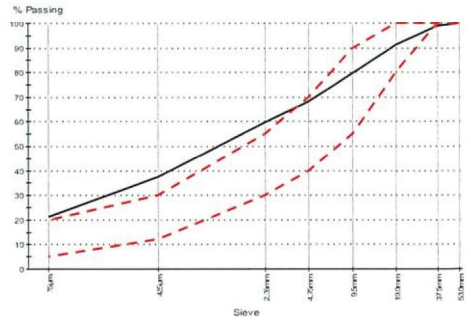
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		9.8	
Date Tested		29/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		2.12	
Standard OMC (%)		8.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		27/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	100
37.5mm	99	100
19.0mm	91	80 – 100
9.5mm	80	55 – 90
4.75mm	68	40 – 70
2.36mm	60	30 – 55
425µm	38	12 – 30
75µm	21	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 17667g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Queensland Government

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Materials Test Report

Report No: MAT:ROK18W-0016-S03
Issue No: 1

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North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

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NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S03
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subbase 1
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	1.6-2.7m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

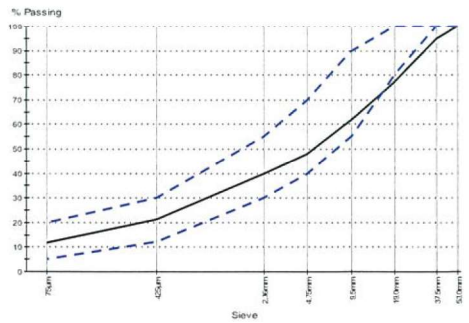
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		5.6	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.2	≤3.5
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	24.6	
Plastic Limit (%)	Q105	19.6	
Plasticity Index (%)	Q105	5.0	≤6
Weighted Plasticity Index (%)	Q105	106	≤150
Weighted Linear Shrinkage (%)	Q106	68	≤85
Sample History		Oven -dried	
Date Tested		25/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		70	
CBR at 2.5 (%)		48	
CBR at 5.0 (%)		70	
Target Dry Density (t/m³)		2.104	
Nominated Relative Compaction (%)		100.0	
Target Moisture Content (%)		7.8	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		2.11	
Achieved Relative Compaction (%)		100.1	
Achieved Moisture Content (%)		7.8	
Achieved % OMC		99.0	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		0.0	
MC After Penetration of Remainder(%)		8.3	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 19/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	100
37.5mm	95	100
19.0mm	77	80 – 100
9.5mm	62	55 – 90
4.75mm	48	40 – 70
2.36mm	40	30 – 55
425µm	21	12 – 30
75µm	12	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 13837g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Queensland Government

Materials Services - Rockhampton
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Materials Test Report

Report No: MAT:ROK18W-0016-S03
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S03
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subbase 1
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	1.6-2.7m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

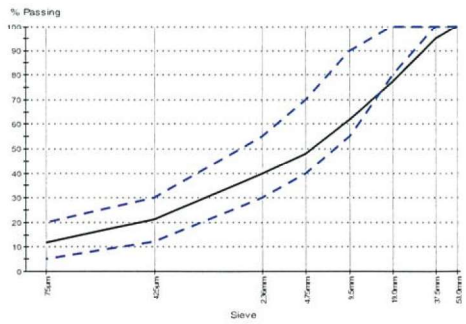
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		8.2	
Date Tested		29/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		2.10	
Standard OMC (%)		8.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		27/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 19/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	100
37.5mm	95	100
19.0mm	77	80 – 100
9.5mm	62	55 – 90
4.75mm	48	40 – 70
2.36mm	40	30 – 55
425µm	21	12 – 30
75µm	12	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 13837g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Materials Services - Rockhampton
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Materials Test Report

Report No: MAT:ROK18W-0016-S04
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA ACCREDITED FOR TECHNICAL COMPETENCE
NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S04
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subbase 2
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	2.7-5.1m R C/Line
Chainage:	Ch 20.01km

Other Test Results

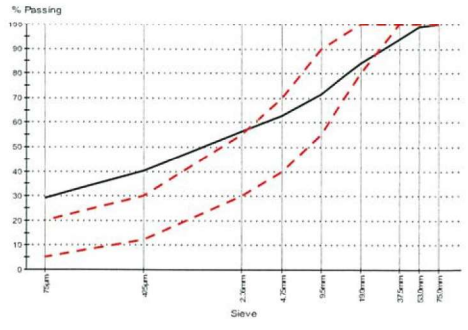
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		10.0	
Remarks			
Date Tested		13/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	4.2	≤3.5
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	28.8	
Plastic Limit (%)	Q105	21.0	
Plasticity Index (%)	Q105	7.8	≤6
Weighted Plasticity Index (%)	Q105	313	≤150
Weighted Linear Shrinkage (%)	Q106	168	≤85
Sample History		Oven -dried	
Date Tested		21/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		15	
CBR at 2.5 (%)		13	
CBR at 5.0 (%)		15	
Target Dry Density (t/m³)		2.016	
Nominated Relative Compaction (%)		100.0	
Target Moisture Content (%)		10.9	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		2.01	
Achieved Relative Compaction (%)		99.7	
Achieved Moisture Content (%)		11.2	
Achieved % OMC		103.0	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		0.1	
MC After Penetration of Remainder(%)		12.0	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 18/06/2018

Sieve Size	% Passing	Limits
75.0mm	100	100
53.0mm	99	100
37.5mm	94	100
19.0mm	84	80 – 100
9.5mm	72	55 – 90
4.75mm	63	40 – 70
2.36mm	56	30 – 55
425µm	40	12 – 30
75µm	29	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 19008g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S04
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

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NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd
(Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S04
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subbase 2
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	2.7-5.1m R C/Line
Chainage:	Ch 20.01km

Other Test Results

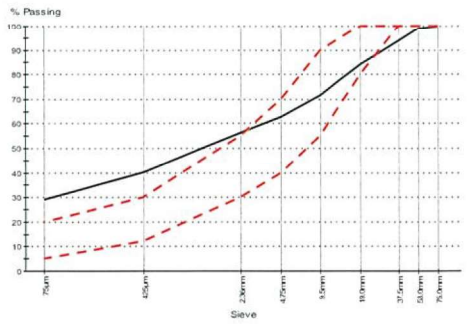
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		13.0	
Date Tested		25/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		2.02	
Standard OMC (%)		11.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		13/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 18/06/2018

Sieve Size	% Passing	Limits
75.0mm	100	100
53.0mm	99	100
37.5mm	94	100
19.0mm	84	80 – 100
9.5mm	72	55 – 90
4.75mm	63	40 – 70
2.36mm	56	30 – 55
425µm	40	12 – 30
75µm	29	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 19008g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S07
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NR

NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S07
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Shoulder Base
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	3.6-4.9m R of C/Line
Chainage:	Ch 21.61km

Other Test Results

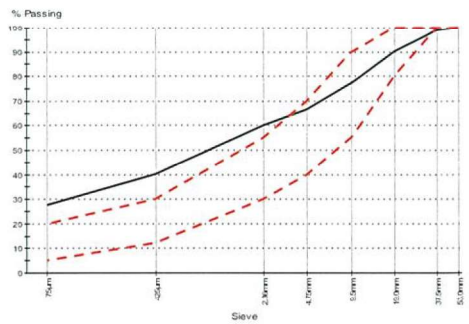
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		6.1	
Remarks			
Date Tested		13/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.4	≤3.5
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	35.0	
Plastic Limit (%)	Q105	30.0	
Plasticity Index (%)	Q105	5.0	≤6
Weighted Plasticity Index (%)	Q105	202	≤150
Weighted Linear Shrinkage (%)	Q106	137	≤85
Sample History		Oven -dried	
Date Tested		21/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		20	
CBR at 2.5 (%)		20	
CBR at 5.0 (%)		20	
Target Dry Density (t/m³)		1.906	
Nominated Relative Compaction (%)		100.0	
Target Moisture Content (%)		11.1	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.91	
Achieved Relative Compaction (%)		100.0	
Achieved Moisture Content (%)		11.1	
Achieved % OMC		100.5	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		0.5	
MC After Penetration of Remainder(%)		15.1	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 19/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	100
37.5mm	99	100
19.0mm	90	80 – 100
9.5mm	77	55 – 90
4.75mm	66	40 – 70
2.36mm	60	30 – 55
425µm	40	12 – 30
75µm	28	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 16684g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Queensland Government

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Materials Test Report

Report No: MAT:ROK18W-0016-S07
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd
(Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S07
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Shoulder Base
Sampled By:	This lab
Specification:	Investigation 'Pavement' Type 2.1
Location:	Port Alma Road
Sample Location:	3.6-4.9m R of C/Line
Chainage:	Ch 21.61km

Other Test Results

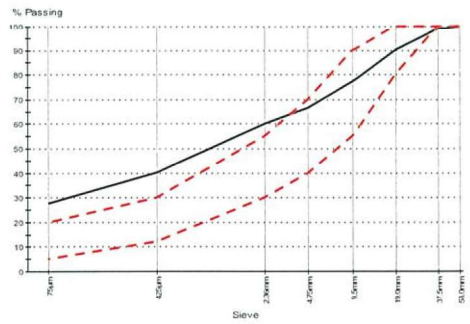
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		15.1	
Date Tested		25/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.91	
Standard OMC (%)		11.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		19/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 19/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	100
37.5mm	99	100
19.0mm	90	80 – 100
9.5mm	77	55 – 90
4.75mm	66	40 – 70
2.36mm	60	30 – 55
425µm	40	12 – 30
75µm	28	5 – 20

Chart



Comments

Variation to test method Q103A insufficient sample mass. 16684g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

APPENDIX 5: SUBGRADE REPORTS

Materials Services - Rockhampton
Department of Transport and Main Roads
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Materials Test Report

Report No: MAT:ROK18W-0016-S05
Issue No: 1

Client: PD & O (Fitzroy)
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North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S05
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	1.6-2.7m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

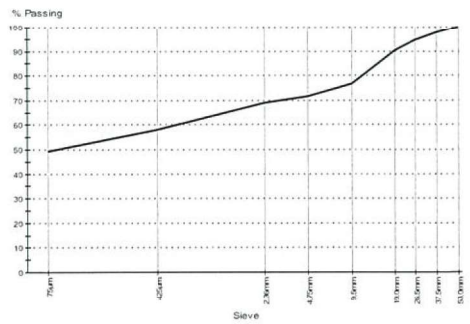
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		16.2	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.8	
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	34.4	
Plastic Limit (%)	Q105	27.6	
Plasticity Index (%)	Q105	6.8	
Weighted Plasticity Index (%)	Q105	396	
Weighted Linear Shrinkage (%)	Q106	221	
Sample History		Oven -dried	
Date Tested		25/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		9.0	
CBR at 2.5 (%)		9.0	
CBR at 5.0 (%)		9.0	
Target Dry Density (t/m³)		1.834	
Nominated Relative Compaction (%)		97.0	
Target Moisture Content (%)		14.7	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.84	
Achieved Relative Compaction (%)		97.4	
Achieved Moisture Content (%)		14.3	
Achieved % OMC		97.0	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		1.0	
MC After Penetration of Remainder(%)		17.6	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 18/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	
37.5mm	98	
26.5mm	95	
19.0mm	90	
9.5mm	77	
4.75mm	72	
2.36mm	69	
425µm	58	
75µm	49	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 13170g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Queensland Government

Materials Test Report

Report No: MAT:ROK18W-0016-S05
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

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Approved Signatory: Brendan Dodd
(Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S05
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	1.6-2.7m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

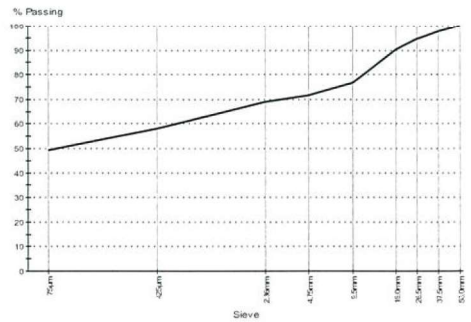
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		20.3	
Date Tested		29/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.890	
Standard OMC (%)		14.7	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		26/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 18/06/2018

Sieve Size	% Passing	Limits
53.0mm	100	
37.5mm	98	
26.5mm	95	
19.0mm	90	
9.5mm	77	
4.75mm	72	
2.36mm	69	
425µm	58	
75µm	49	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 13170g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

Queensland Government

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Materials Test Report

Report No: MAT:ROK18W-0016-S06
Issue No: 1

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NATA Accredited Laboratory Number 2302
Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S06
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.7-5.1m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

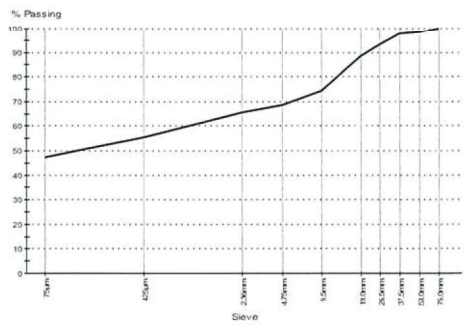
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		16.5	
Remarks			
Date Tested		25/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	4.4	
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	34.8	
Plastic Limit (%)	Q105	26.0	
Plasticity Index (%)	Q105	8.8	
Weighted Plasticity Index (%)	Q105	487	
Weighted Linear Shrinkage (%)	Q106	244	
Sample History		Oven -dried	
Date Tested		21/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		8.0	
CBR at 2.5 (%)		7.5	
CBR at 5.0 (%)		8.0	
Target Dry Density (t/m³)		1.808	
Nominated Relative Compaction (%)		97.0	
Target Moisture Content (%)		13.9	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.81	
Achieved Relative Compaction (%)		97.0	
Achieved Moisture Content (%)		14.0	
Achieved % OMC		100.5	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		2.3	
MC After Penetration of Remainder(%)		19.2	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 15/06/2018

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	98	
37.5mm	98	
26.5mm	93	
19.0mm	89	
9.5mm	74	
4.75mm	69	
2.36mm	65	
425µm	55	
75µm	47	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 10510g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S06
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S06
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.7-5.1m R of C/Line
Chainage:	Ch 20.01km

Other Test Results

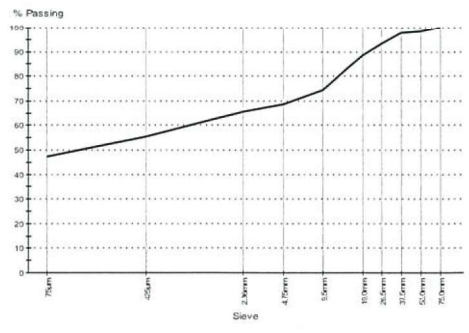
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		20.8	
Date Tested		28/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.864	
Standard OMC (%)		13.9	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		25/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 15/06/2018

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	98	
37.5mm	98	
26.5mm	93	
19.0mm	89	
9.5mm	74	
4.75mm	69	
2.36mm	65	
425µm	55	
75µm	47	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 10510g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S08
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

Accredited for compliance with ISO/IEC 17025 - Testing

NATA Accredited Laboratory Number 2302

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S08
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.2-4.9m R of C/Line
Chainage:	Ch 21.61km

Other Test Results

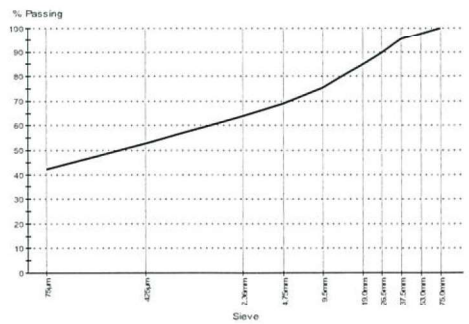
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		13.3	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	2.3	
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	33.0	
Plastic Limit (%)	Q105	25.6	
Plasticity Index (%)	Q105	7.4	
Weighted Plasticity Index (%)	Q105	391	
Weighted Linear Shrinkage (%)	Q106	148	
Sample History		Oven -dried	
Date Tested		20/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		15	
CBR at 2.5 (%)		15	
CBR at 5.0 (%)		14	
Target Dry Density (t/m³)		1.846	
Nominated Relative Compaction (%)		97.0	
Target Moisture Content (%)		13.0	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.84	
Achieved Relative Compaction (%)		96.8	
Achieved Moisture Content (%)		13.3	
Achieved % OMC		102.0	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		0.5	
MC After Penetration of Remainder(%)		17.2	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 15/06/2018

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	97	
37.5mm	95	
26.5mm	90	
19.0mm	85	
9.5mm	75	
4.75mm	69	
2.36mm	64	
425µm	53	
75µm	42	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 23826g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S08
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NATA Accredited Laboratory Number 2302
Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S08
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.2-4.9m R of C/Line
Chainage:	Ch 21.61km

Other Test Results

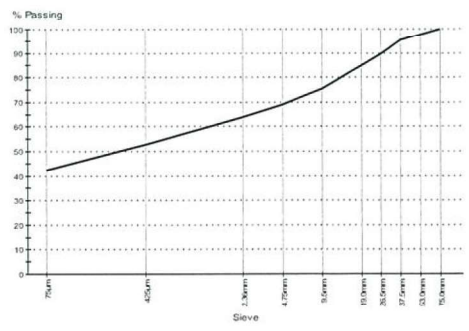
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		16.4	
Date Tested		29/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.903	
Standard OMC (%)		13.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		27/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 15/06/2018

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	97	
37.5mm	95	
26.5mm	90	
19.0mm	85	
9.5mm	75	
4.75mm	69	
2.36mm	64	
425µm	53	
75µm	42	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 23826g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S09
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S09
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.0-5.2m R of C/Line
Chainage:	Ch 21.61km

Other Test Results

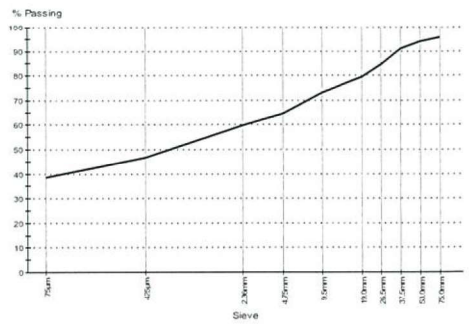
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		15.0	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.4	
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	32.8	
Plastic Limit (%)	Q105	26.6	
Plasticity Index (%)	Q105	6.2	
Weighted Plasticity Index (%)	Q105	277	
Weighted Linear Shrinkage (%)	Q106	152	
Sample History		Oven -dried	
Date Tested		25/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		9.0	
CBR at 2.5 (%)		9.0	
CBR at 5.0 (%)		8.5	
Target Dry Density (t/m³)		1.793	
Nominated Relative Compaction (%)		97.0	
Target Moisture Content (%)		14.1	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.80	
Achieved Relative Compaction (%)		97.6	
Achieved Moisture Content (%)		13.2	
Achieved % OMC		94.0	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		1.0	
MC After Penetration of Remainder(%)		18.1	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 19/06/2018

Sieve Size	% Passing	Limits
75.0mm	96	
53.0mm	94	
37.5mm	91	
26.5mm	84	
19.0mm	79	
9.5mm	73	
4.75mm	65	
2.36mm	60	
425µm	47	
75µm	38	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 14617g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S09
Issue No: 1

Client: PD & O (Fitzroy)
Knight St
North Rockhampton Qld 4701

Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd
(Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S09
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	12/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.0-5.2m R of C/Line
Chainage:	Ch 21.61km

Other Test Results

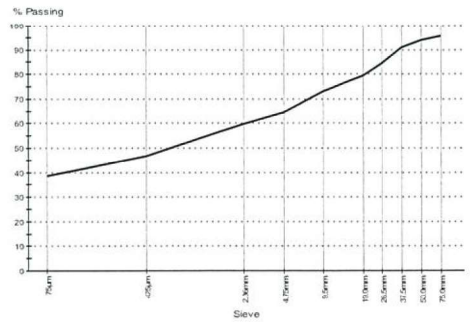
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		19.9	
Date Tested		29/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.848	
Standard OMC (%)		14.1	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		26/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 19/06/2018

Sieve Size	% Passing	Limits
75.0mm	96	
53.0mm	94	
37.5mm	91	
26.5mm	84	
19.0mm	79	
9.5mm	73	
4.75mm	65	
2.36mm	60	
425µm	47	
75µm	38	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 14617g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S16
Issue No: 1

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NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 10/07/2018

Sample Details

Sample ID:	ROK18W-0016-S16
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	13/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.2-5.6m R of C/Line
Chainage:	Ch 24.38km

Other Test Results

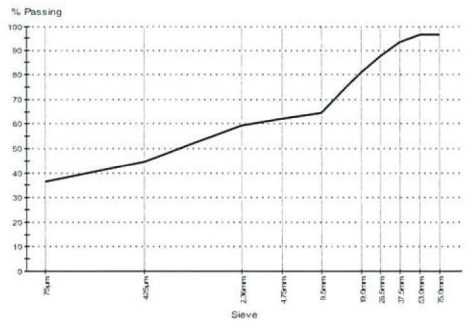
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		13.3	
Remarks			
Date Tested		25/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	2.2	
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	33.6	
Plastic Limit (%)	Q105	27.6	
Plasticity Index (%)	Q105	6.0	
Weighted Plasticity Index (%)	Q105	268	
Weighted Linear Shrinkage (%)	Q106	98	
Sample History		Oven -dried	
Date Tested		21/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		23	
CBR at 2.5 (%)		23	
CBR at 5.0 (%)		22	
Target Dry Density (t/m³)		1.896	
Nominated Relative Compaction (%)		97.0	
Target Moisture Content (%)		12.4	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.90	
Achieved Relative Compaction (%)		97.2	
Achieved Moisture Content (%)		12.2	
Achieved % OMC		98.5	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		0.5	
MC After Penetration of Remainder(%)		14.8	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
75.0mm	96	
53.0mm	96	
37.5mm	93	
26.5mm	87	
19.0mm	81	
9.5mm	65	
4.75mm	62	
2.36mm	60	
425µm	45	
75µm	36	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 16372g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

Report No: MAT:ROK18W-0016-S16
Issue No: 1

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Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 10/07/2018

Sample Details

Sample ID:	ROK18W-0016-S16
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	13/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.2-5.6m R of C/Line
Chainage:	Ch 24.38km

Other Test Results

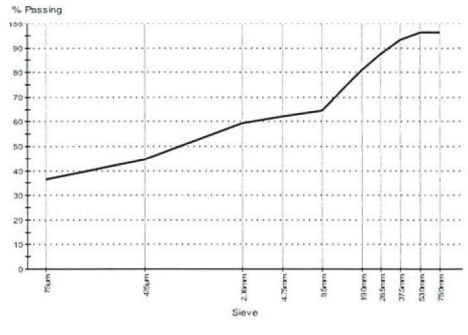
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		14.9	
Date Tested		28/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.954	
Standard OMC (%)		12.4	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		25/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
75.0mm	96	
53.0mm	96	
37.5mm	93	
26.5mm	87	
19.0mm	81	
9.5mm	65	
4.75mm	62	
2.36mm	60	
425µm	45	
75µm	36	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 16372g sample used.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

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Project: Port Alma Road Widening and Safety Improvements

NATA Accredited Laboratory Number 2302

Accredited for compliance with ISO/IEC 17025 - Testing

NR

Approved Signatory: Brendan Dodd
(Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S19
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	13/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.2-5.4m R of C/Line
Chainage:	Ch 25.22km

Other Test Results

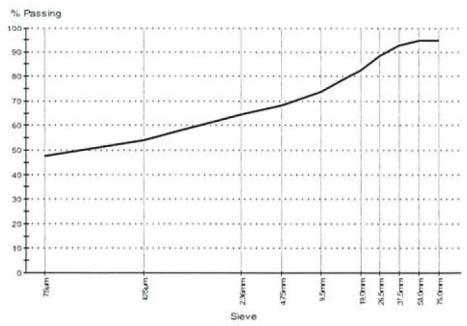
Description	Method	Result	Limits
Moisture Content [Q102A]			
Moisture Content (%)		14.2	
Remarks			
Date Tested		26/06/2018	
Atterberg Limits (One Point Liquid Limit) [Q104D/Q105/Q106]			
Linear Shrinkage (%)	Q106	3.0	
Air Drying Used?		Yes	
Liquid Limit (%)	Q104D	36.6	
Plastic Limit (%)	Q105	30.4	
Plasticity Index (%)	Q105	6.2	
Weighted Plasticity Index (%)	Q105	334	
Weighted Linear Shrinkage (%)	Q106	162	
Sample History		Oven -dried	
Date Tested		21/06/2018	
California Bearing Ratio [Q113C]			
CBR (%)		11	
CBR at 2.5 (%)		11	
CBR at 5.0 (%)		11	
Target Dry Density (t/m³)		1.853	
Nominated Relative Compaction (%)		97.0	
Target Moisture Content (%)		13.0	
Nominated % OMC		100	
Achieved Dry Density (t/m³)		1.85	
Achieved Relative Compaction (%)		97.1	
Achieved Moisture Content (%)		12.9	
Achieved % OMC		99.5	
Soaked		Yes	
Duration of Soaking (Days)		4	
Swell (%)		1.2	
MC After Penetration of Remainder(%)		17.7	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
75.0mm	95	
53.0mm	95	
37.5mm	93	
26.5mm	88	
19.0mm	82	
9.5mm	74	
4.75mm	68	
2.36mm	65	
425µm	54	
75µm	48	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 15522g sample used.
Variation to test method Q113C CL 5.4.3 (a). Specimen soaked for shorter than 96±4 hours. 90 hours soak time.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

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Materials Test Report

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NATA Accredited Laboratory Number 2302

Approved Signatory: Brendan Dodd (Materials Technologist)
Date of Issue: 9/07/2018

Sample Details

Sample ID:	ROK18W-0016-S19
Sampling Method:	AS 1289.1.2.1 Cl 6.5.4
Date Sampled:	13/06/2018
Source:	As per location
Material:	Subgrade
Sampled By:	This lab
Specification:	Investigation 'Subgrade'
Location:	Port Alma Road
Sample Location:	2.2-5.4m R of C/Line
Chainage:	Ch 25.22km

Other Test Results

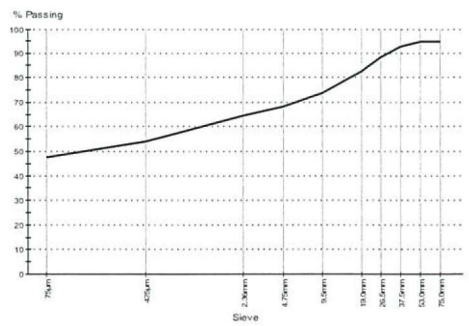
Description	Method	Result	Limits
California Bearing Ratio [Q113C]			
MC After Penetration of Penetrated End (%)		18.7	
Date Tested		28/06/2018	
Maximum Dry Density - Standard [Q142A]			
Standard MDD (t/m³)		1.910	
Standard OMC (%)		13.0	
MC Test Method			
Oversize Sieve (mm)		0.0	
Oversize Material - Grading (%)			
Oversize Material - Wet (%)			
Oversize Material - Dry (%)			
Density of Oversize (t/m³)			
Additive Type			
Additive Source			
Additive Proportion (%)			
Date Tested		27/06/2018	

Particle Size Distribution

Method: Q103A
Drying by: Oven
Date Tested: 20/06/2018

Sieve Size	% Passing	Limits
75.0mm	95	
53.0mm	95	
37.5mm	93	
26.5mm	88	
19.0mm	82	
9.5mm	74	
4.75mm	68	
2.36mm	65	
425µm	54	
75µm	48	

Chart



Comments

Variation to test method Q103A insufficient sample mass. 15522g sample used.
Variation to test method Q113C CL 5.4.3 (a). Specimen soaked for shorter than 96±4 hours. 90 hours soak time.
The target compacted dry density and the nominated relative moisture content values are reported to Q113C November 2014 reporting requirements.

APPENDIX 6: SITE PHOTOGRAPHS

Photo A6-1: Pothole Ch. 20.01km

Photo A6-2: Pothole Ch. 20.01km

Photo A6-3: Pothole Ch. 20.01km (RHS)

Photo A6-4: Pothole Ch. 20.01km (LHS)

Photo A6-5: Pothole Ch. 20.01km

Photo A6-6: Pothole Ch. 20.01km

Photo A6-7: Pothole Ch. 20.01km

Photo A6-8: Pothole Ch. 20.01km

Photo A6-9: Pothole Ch. 21.61km

Photo A6-10: Pothole Ch. 21.61km

Photo A6-11: Pothole Ch. 21.61km (RHS)

Photo A6-12: Pothole Ch. 21.61km (LHS)

Photo A6-13: Pothole Ch. 21.61km

Photo A6-14: Pothole Ch. 21.61km

Photo A6-15: Pothole Ch. 21.61km

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Photo A6-17: Pothole Ch. 23.32km

Photo A6-18: Pothole Ch. 23.32km

Photo A6-19: Pothole Ch. 23.32km (RHS)

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Photo A6-21: Pothole Ch. 23.32km

Photo A6-22: Pothole Ch. 23.32km

Photo A6-23: Pothole Ch. 23.32km

Photo A6-24: Pothole Ch. 24.38km

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Photo A6-31: Pothole Ch. 25.22km

Photo A6-32: Pothole Ch. 25.22km

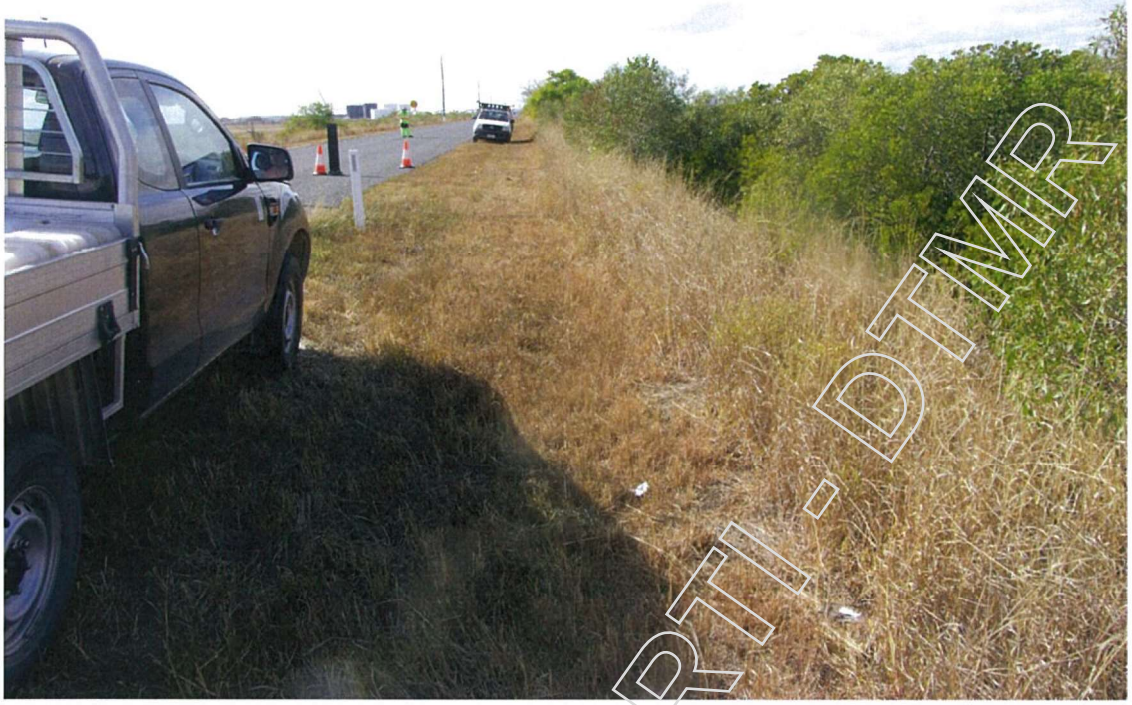

Photo A6-33: Pothole Ch. 25.22km (RHS)

Photo A6-34: Pothole Ch. 25.22km (RHS)

Photo A6-35: Pothole Ch. 25.22km

Photo A6-36: Pothole Ch. 25.22km

Photo A6-37: Pothole Ch. 25.22km

Appendix E ACID SULFATE SOILS, BAJOOL – PORT ALMA AREA (ISSUED IN 2007)

ACID SULFATE SOILS,

BAJOOL – PORT ALMA AREA,

CENTRAL QUEENSLAND COAST

Queensland Government
Natural Resources and Water

ACID SULFATE SOILS,

BAJOOL – PORT ALMA AREA,

CENTRAL QUEENSLAND COAST

Department of Natural Resources and Water
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Acid Sulfate Soils (1:50 000 scale).

Acid Sulfate Hazard (1:50 000 scale).

Summary

Acid sulfate soil mapping has been undertaken at 1:50 000 scale for a section of the Fitzroy River lower estuary from Bajool to Port Alma. The mapping identifies areas of both actual acid sulfate soils and potential acid sulfate soils and their depth of occurrence. The land containing acid sulfate soils occurs mainly within the tidal zone with an elevation of less than 5m Australian Height Datum.

Within the Bajool – Port Alma survey area, there are 6,908.3 ha of land mapped with acid sulfate soils. Actual acid sulfate soils total 1,325 ha, and potential acid sulfate soils 5,583.3 ha. A further 3,253.2 ha of disturbed land, and land with limited field assessment are likely to contain acid sulfate soils.

Descriptions of the acid sulfate soil map units are presented in this report. Chemical data for selected depth samples are appended. Sample site locations and the distribution of acid sulfate soils are illustrated on the accompanying Acid Sulfate Soils map.

A map presenting acid sulfate soil hazard for the area has also been included. This map is an assessment of the acid sulfate soil mapping and chemical data in which land is classified into four classes of acid generation potential. The four classes are very low, low, moderate and high. The distribution of soils with potential for acid generation is shown on the Acid Sulfate Hazard map.

The acid sulfate soils are dominantly heavy clay sediments, and saturated with a shallow or perched watertable. Actual acid sulfate soils are greyish brown in colour with pale yellow mottles overlying grey to greenish grey substrate materials with some organic matter. Potential acid sulfate soils are typically greenish grey to dark grey in colour with some organic materials.

Fifty-two percent of the area assessed with actual and potential acid sulfate soils has acid sulfate soil layers within 1 m depth from the soil surface. Layers of moderate acid generation potential occur within 1m depth from the soil surface over much of the area.

Oxidisable sulfur levels of up to 3.5% and potential acidities up to 2,529 mol H^+/t were recorded on a supratidal flat. At slightly lower elevations, the intertidal flats have up to 2.3% oxidisable sulfur and potential acidities to 1,396 mol H^+/t. These levels are lower than the levels previously recorded for survey areas for the southern portion of the Central Queensland coast.

Six piezometers or shallow groundwater monitoring bores were installed to determine the characteristics of the shallow groundwater draining into the estuary. Field results indicate very low to low levels of dissolved oxygen during the latter part of the sampling period, and elevated electrical conductivity readings in all of the standing waters of the bores.

1. Introduction

A mapping project to identify the extent of acid sulfate soils at six coastal locations in Central Queensland has been initiated by the Fitzroy Basin Association, Mackay Whitsunday Natural Resource Management Group, and the Department of Natural Resources and Water (NRW) with funding support from the Natural Heritage Trust (NHT). Priority areas for mapping are centred around the Rockhampton and Mackay districts. As well as providing substantial in kind support, NRW was contracted to assist in identifying areas for mapping, undertaking field surveys and to provide laboratory analysis of soil and water samples.

The Bajool - Port Alma area is the second of three priority areas to be mapped along the southern Central Queensland coast. It is situated in the lower Fitzroy River estuary approximately 40 km by road south of Rockhampton (Figure 1). The survey area is largely characterised by saltpans, contains extensive saltworks, and the port facilities for Rockhampton City. The survey area is approximately 10,200 ha in area.

Reconnaissance sampling of acid sulfate soils along the southern part of the Central Queensland coast (Ross 2002) had identified acid sulfate soils at several locations on the lower Fitzroy River floodplain and estuary. Fish kills occur occasionally in local creeks draining into the estuary and it is unknown if these are related to acid sulfate soil presence or disturbance. A major expansion of saltworks has been proposed within the survey area. This mapping project provides a representative area of acid sulfate soil mapping for the lower Fitzroy River estuary. It has been undertaken at 1:50 000 scale and represents a medium intensity survey with the maps and report intended for planning purposes. Map unit description and chemical data from laboratory analyses are presented in this report.

Acid sulfate soils (ASS) are soils or sediments containing sulfides (primarily pyrite) or an acid producing layer as the result of the oxidation of sulfides. They commonly occur on tidal land and low-lying very poorly drained coastal land at elevations less than 5m AHD (Australian Height Datum). Excavating soil or sediment, extracting groundwater or filling land may cause disturbance of acid sulfate soils. When exposed to air, sulfides oxidise to produce sulfuric acid. Disturbed land can release acid, aluminium, iron and heavy metals into drainage waters affecting aquatic plants and animals. Concrete and steel infrastructure including pipes, foundations and bridges are susceptible to acidic corrosion leading to accelerated structural failure (Ahern *et al*. 1988, Powell and Martins 2005). Other potential impacts include the deoxygenation of waterways (Bush *et al*. 2004) and the excess iron stimulating blooms of cyanobacteria such as *Lyngbya majuscula* or fireweed.

Both actual acid sulfate soil (AASS) and potential acid sulfate soils (PASS) occur throughout the survey area. AASS are soils or sediments containing highly acidic soil horizons or layers caused by the oxidation of soil materials that are rich in iron sulfides, primarily pyrite. This oxidation produces hydrogen ions in excess of the sediments capacity to neutralise the acidity, resulting in soils or sediments of pH 4 or less. PASS are soils or sediment containing iron sulfides or sulfidic materials that have not been exposed to air and oxidised. The field pH of these soils or sediment in there undisturbed state is pH 4 or more, and may be neutral or slightly alkaline (Anon 2002).

Figure 1. Location of the survey area.

2. Survey Area

The lower Fitzroy River estuary from Port Alma to Bajool consists mainly of bare saltpan and mangrove mudflat with occasional areas of slightly elevated marine couch flat and low lying plains. Saltworks occupy a substantial area of the saltpan at Port Alma and Bajool. Mangrove communities are restricted to the tidal creek banks and channels extending into the saltpan. Grey and river mangroves are common with the red mangrove mostly found in tidal channels. Landward of the tidal zone lies gently sloping alluvial plains with remnant blue-gum, belah or gum-topped box communities.

Broad-scale geological mapping of the survey area has been compiled by Blake *et al*. (2001). Most of the sulfidic sediments assessed in this investigation occur in Quaternary (Holocene) estuarine mud and sand deposits in saltpans and mangrove mudflats at elevations <5m AHD. They also occur in clay sediments of an area mapped as the low terrace of Inkerman and Eight Mile Creeks, and beneath elevated areas of Fitzroy River floodplain alluvium. The only outcrop of hard rock observed in the survey area occurs immediately north of the meander bend of Raglan Creek at Port Alma.

Recent studies and sediment dating (Brooke *et al*.; Bostock *et al*. 2006) indicate the Fitzroy River estuary prograded to its present position in southern Keppel Bay about 6,000 years ago. A relatively thick layer (>4m) of clay sediment has generally been deposited over channel/marine sands. The current estuarine floodplain has little accommodation space for further sediment deposition, and relatively little sediment appears to be accumulating in Keppel Bay. Tidal creeks, mangrove areas and the estuary mouth are areas where current sediment accumulation occurs (Brooke *et al*. 2006).

Bajool - Port Alma is the major production area of solar evaporated salt in Queensland. Sea water is used for most of the current salt production and has largely replaced the pumping of brine from groundwater sources. Port Alma, the ocean port for the city of Rockhampton, currently imports ammonium nitrate, explosives and general cargo. Exports include frozen beef, tallow, and explosives (Anon 2006). Recreational fishing in the streams and channels of the Fitzroy estuary is a significant land use activity.

3. Methods

Sites for description and assessment were selected using a free survey technique (Reid 1988) with the aid of 1:25 000 scale colour aerial photographs. The accompanying acid sulfate soil map has been compiled at 1:50 000 scale and meets the sampling requirements for medium intensity soil mapping. Areas with actual acid sulfate soils (AASS) and potential acid sulfate soils (PASS) at various depths are shown on the map from field observation and interpretation. Acid sulfate soil information collected during a previous survey (Ross 2002) is used in the compilation. The map reference was adopted from the Queensland Acid Sulfate Soil Investigation Team (QASSIT). Site and soil description follows the Australian Soil and Land Survey Field Handbook (McDonald *et al*. 1990).

Most of the saltpan and mangrove mudflat sampling was undertaken using a 60mm diameter stainless steel Dormer gouge auger following removal of the unsaturated heavy clay layer by spade (Figure 2). Saturated clay and / or silt layers were sampled to 1.8m depth or to the depth of hand penetration. Hydraulically driven stainless steel push tubes (75mm diameter) combined with tapered gouge augers (73, 60 and 48mm diameter) and push rods were used to sample sites with clay sediments and vehicle access (Figure 3). Deep sampling was undertaken using Geoprobe® percussion coring equipment (Figure 4).

Field pH tests and Electrical Conductivity (EC) tests were carried out using a WP81 pH-conductivity meter fitted with an IJ44 pH electrode. Field pH (pH_F) and field pH peroxide (pH_{FOX}) measurements were determined at 0.25m intervals or less to the depth of sampling in accordance with QASSIT guidelines (Ahern *et al*. 1998). Dissolved oxygen of piezometer waters was measured using a WP82Y Dissolved Oxygen-Temperature meter fitted with a YSI 5739 field probe. Piezometer installation followed the standards outlined in Minimum Construction Requirements for Water Bores in Australia (Anon 2004).

Following field pH tests, samples for laboratory analysis at each site were selected from the upper depth of occurrence of the acid sulfate soil layer, for confirmation of the depth category for mapping. The lower depth of occurrence of the ASS layer was also usually sampled at each site. More frequent sampling down the soil profile occurred at Geoprobe cored sites. Selected samples were placed in a portable refrigerator / freezer and packed frozen for dispatch to Brisbane by overnight air express.

Selected soil samples from each site were analysed for peroxide oxidisable sulfur, titratable actual acidity and titratable potential acidity using the Suspension Peroxide Oxidation Combined Acidity and Sulfur (SPOCAS) method (Ahern *et al*. 2004). Laboratory results are given in Appendix 1. Selected samples with jarosite or a field pH $\leq$ 5 were analysed for retained acidity by the Net Acid Soluble Sulfur (S_{NAS}) method (Ahern *et al*. 2004), and the results listed in Appendix 2.

Figure 2. Gouge auger sampling, supratidal flat, Bajool.

Figure 3. Push tube sampling, elevated plain, Pelican Creek.

Figure 4. Geoprobe core sampling, alluvial plain, Twelve Mile Creek.

4. Description of the soil map units

The depth to an actual acid sulfate soil (AASS) layer and/or potential acid sulfate soil (PASS) layer on relatively undisturbed land is shown on the accompanying soil map by an alphanumeric code. The alpha component A refers to an AASS layer, the alpha component S to a PASS layer while the numerical component (for example 0,1,2 etc) refers to the depth at which these layers occur. The alphanumeric codes are used separately (for example A0) or combined (for example A0S0) where the map unit contains AASS layers overlying PASS layers. Where there is varying depth to an acid sulfate soil layer within a mapping unit a forward slash is used, for example S1/S2. The acid sulfate soil map units, of relatively undisturbed land, depict varying depths to the acid sulfate soil layer, are coloured using shades of red and are overlain with yellow dots where AASS is present.

Additional information is provided (by code) for areas of soils with a strongly acid soil layer (pH >4 <5), for example a1S1 and for those containing carbonate materials (subscript N). Other map units indicate ASS on disturbed lands (S_{DL}) or areas where there was limited assessment due to restricted access (S_{LA}). The distribution of land where there is a low probability of ASS occurring below an elevation of 5m AHD (LP) is also shown on the map.

There are 6,908.3 ha of acid sulfate soils mapped within the survey area. This area contains approximately 1,325 ha of land with AASS and 5,583.3 ha of land with PASS (Table 1). Other map units (S_{DL}, S_{LA}) indicating areas of land where ASS are likely to occur, total 3,253.2 ha.

4.1 *Actual Acid Sulfate Soils on Relatively Undisturbed Land*

A0S0 (AASS layer and PASS layer within 0.5m depth)

Two relatively small map unit areas are represented by the code A0S0. One is located adjacent to Casuarina Creek at Port Alma and the other adjacent to Inkerman Creek south of the Bajool saltworks. The landform is an infrequently inundated supratidal flat or bare saltpan. The soils have a thin brown, structured, heavy clay surface horizon overlying a grey or greyish brown clay subsoil of similar thickness with pale yellow jarosite mottles. The underlying PASS layers are dark grey or greenish grey silty medium clays with some organic materials.

Titratable Actual Acidity (TAA) in the AASS layer is low (21 to 51 mol H^+/t) and retained acidity negligible (3 to 9 mol H^+/t). Oxidisable sulfur levels in the potential acid sulfate soil layers range from 0.53 to 1.73%.

A0S1 (AASS layer within 0.5m depth, PASS layer 0.5 to 1m depth)

The A0S1 map units are mostly located adjacent to and south of the Port Alma saltworks, with one mapped area situated east of the Bajool saltworks. These supratidal flats or saltpans appear to be only marginally elevated to the adjoining saltpan with potential acid sulfate soils. The soils have a dark greyish brown to dark brown, massive or moderately structured heavy clay surface horizon overlying grey or greyish brown medium heavy clay subsoils with red mottles, and yellow jarositic mottles. At less than 1m depth the potential acid sulfate soil layers are dark grey or dark greenish grey silty or medium clays with organic fragments.

The levels of oxidisable sulfur in the actual acid sulfate soil layers range from 0.01 to 0.06% and actual acidity from <10 to 19 mol H^+/t. Retained acidity values range from negligible to significant levels (<10 to 369 mol H^+/t). Oxidisable sulfur values in the unoxidised substrate range from 0.8 to 1.83% with corresponding Net Acidities of 391 to 1,180 mol H^+/t.

Table 1. Area of map units.

Map Unit	Map Unit Area (ha)	Percentage of Area Assessed (%)
Actual acid sulfate soils		
A0S0	24.4	0.23
A0S1	280.9	2.73
A0S2	92.2	0.90
A1S2	581.6	5.67
A2	103.8	1.01
A2S2	93.9	0.91
A2S3	24.5	0.24
A3	102.4	1.00
A3S3	21.3	0.21
Total	**1325.0**	**12.90**
Potential acid sulfate soils		
a0S0	62.6	0.61
S0	599.5	5.85
S0/S1	1298.8	12.65
$S0S1_N$	71.1	0.69
a0S1	145.3	1.41
S1	2224.5	21.66
a1S2	429.1	4.18
S2	722.9	7.01
S3	29.5	0.29
Total	**5583.3**	**54.35**
Acid sulfate on undisturbed land		
S_{LA}	274.1	2.67
Acid sulfate on disturbed land		
S_{DL}	2979.1	29.00
Low probability ASS land		
LP	111.4	1.08
Total area	**10272.9**	**100**

A0S2 (AASS layer within 0.5m depth, PASS layer 1 to 2m depth

Supratidal flats adjoining Eight Mile and Twelve Mile creeks and an elevated area of marine couch plain near the south west corner of the survey area (Figure 5) comprise this mapping unit. The soils are strongly acid (field pH <4) throughout. The top 1 to 2m contains a thick layer with jarosite with low levels of actual and peroxide acidity. Seasonally wet areas of the map units have soils with an organic enriched surface horizon.

The grey or dark grey heavy clay subsoils are structured with red, orange and yellow mottles in the upper subsoil (Figure 6) grading to structure-less lower subsoils with some pale yellow jarosite mottles. These are underlain by layers of grey or greenish grey light to medium clays with some organic fragments.

Laboratory analysis of the actual acid sulfate soil layers indicate most are fully oxidised with very low levels of oxidisable sulfur (<0.01 to 0.04%). Actual acidity of these oxidised soils is low (<50 mol H^+/t), while retained acidity is significant (134 to 370 mol H^+/t). Peroxide acidity of the unoxidised layers at depth range from 135 to 1,160 mol H^+/t.

A1S2 (AASS layer 0.5 to 1m depth, PASS layer 1 to 2m depth)

The largest area of actual acid sulfate soils recorded in the survey area (581.6 ha) are represented by this map unit. The landform is dominantly a supratidal flat (bare saltpan) with some slightly elevated areas with marine couch and samphire. Isolated clumps of she-oak (*Casuarina* species) occur throughout the map units adjacent to Inkerman and Raglan creeks. Tidal inundation appears to be less frequent in comparison with adjacent saltpan areas.

The soils are well structured dark brown or black heavy clays grading to greyish brown or grey mottled clays. A moderately thick (0.8m) layer containing jarosite overlies grey to dark grey saturated clays with some organic fragments. Titratable Actual Acidity levels of the layers containing jarosite are low (<50 mol H^+/t). Retained acidity of these layers is generally higher and ranges from <10 to 298 mol H^+/t. Peroxide acidity for the unoxidised substrate is commonly less than 500, with a maximum level of 1,137 mol H^+/t recorded in one map unit.

A2 and **A3** (AASS layer 1 to 3m depth, no PASS layer)

These map unit areas partly form the brine pond walls of the Port Alma saltworks. Much of the elevated plains represented by this unit (Figure 7) contain open woodland of blue gum (*Eucalyptus tereticornis*) with a ground cover of dominantly marine couch. The soils are dark grey to black cracking clays with normal gilgai micro-relief. They overlie a very thick acid layer (2m) of saturated grey heavy clay with jarosite which is underlain by un-saturated mottled clay below 3.5 m depth.

Laboratory results indicate the soil profiles to be fully oxidised with negligible levels of peroxide oxidisable sulfur (<0.01%). Actual acidity and retained acidity of the very thick jarosite layer is low (10 to 33 mol H^+/t) and (6 to 84 mol H^+/t), respectively.

A2S2 and **A2S3** (AASS layer 1 to 2m depth, PASS layer 1 to 3m depth)

Marine couch flats (extratidal flats) with isolated shrubs or blue gum trees represent this map unit. They are situated along the meander plain of Inkerman Creek. The soils are structured dark grey or olive brown heavy clays overlying a thick grey layer (1m) containing jarosite. Fine sandy or silty sediments can be present in the deep substrate.

Oxidisable sulfur levels of the ASS layers containing jarosite are negligible (<0.2%), and actual acidity levels very low (<46 mol H^+/t). Retained acidity levels are low (5 to 143 mol H^+/t). The PASS layers contain moderate (0.45 to 0.8%) levels of oxidisable sulfur in the upper substrate increasing to a maximum level of 1.2% at 2 to 3m depth.

Figure 5. Marine couch plain, A0S2 map unit, Bajool.

Figure 6. AASS layer with jarosite over greenish grey PASS layer.

Figure 7. Elevated plain with blue gum woodland, A3 map unit.

A3S3 (AASS layer and PASS layer 2 to 3m depth)

This small map unit adjoins the Bajool saltworks along the Bajool Port Alma road. The landform is an extratidal flat (marine couch flat) with some bare saltpan areas and samphires. The soils are mottled greyish brown heavy clays with a moderately thick (0.5m) layer containing jarosite below 2m depth. At 4m depth the grey medium clay PASS layer overlies layers of sandy clay with some shell fragments, which in turn is underlain by pale brown single-grain sand.

Oxidisable sulfur levels in the medium clay PASS layer are moderate (0.31 to 0.44%), while the level recorded for the underlying sandy clay at 4.3m depth is low (0.14%). Negligible levels of oxidisable sulfur (<0.01%) are indicated for AASS layer and for the pale brown sand substrate.

4.2 *Potential Acid Sulfate Soils on Relatively Undisturbed Land*

a0S0 (Strongly acidic layer and PASS layer within 0.5m depth)

This single map unit is located within the meander bend of Raglan Creek at Port Alma and immediately north of the low rise of country rock (map code NA). The landform is a supratidal flat (bare saltpan). The soils have a thin brown surface layer and a mottled strongly acidic subsoil layer within 0.5m depth of the soil surface. Field pH of the strongly acidic subsoil layer is 4.2 to 4.4. The underlying greenish grey silty clay substrate is slightly acid to neutral with some organic fragments.

Oxidisable sulfur and actual acidity levels in the strongly acidic layer are negligible (<0.02% and <12 mol H^+/t respectively). Retained acidity measurement of this layer from two of the sampling sites exceeds the Action Criteria (Ahern *et al*. 1998) requiring treatment. Moderate levels of oxidisable sulfur (0.8 to 1.4%) and acid generation potential (305 to 809 mol H^+/t) occur in the greenish grey substrate.

S0 (PASS layer within 0.5m depth)

Two areas comprise this map unit. They are located at Port Alma and within a meander loop of Inkerman Creek at Bajool. The map unit at Port Alma is largely supratidal (bare saltpan) but includes some intertidal areas associated with mangrove mudflats. The Bajool unit is represented by a supratidal flat.

The soils are either dark grey, greenish grey or mottled grey medium to heavy clays with a brown or dark greyish brown surface horizon. Layers with organic materials are present within the saturated sediments below 0.5m depth, particularly at sites with mangrove cover. The levels of oxidisable sulfur range from 0.5 to 2.3%, but are commonly <1% throughout the map unit.

S0/S1 (PASS layer 0 to 1m depth)

This map unit area with varying depth to the PASS layer (0 to 1m), is substantial in size (1,298.8 ha) and represents 12.65% of the area of potential acid sulfate soils. The area is located between the Bajool saltworks and Port Alma, and occupies much of the tidal flats

between Inkerman and Casuarina creeks. The landform is largely supratidal flats (bare saltpan) with significant areas of intertidal flats (mangrove mudflat).

The soils near Port Alma, particularly north of the Bajool Port Alma road, generally have lighter textures with layers of light clay overlying layers of fine sandy clay with some shell fragments. The levels of oxidisable sulfur and net acidity in the 0 to 0.5m and 0.5 to 1m depth categories are moderate (0.33 to 1.07% and 219 to 678 mol H^+/t respectively). Below 1m depth negligible levels of net acidity (<10 mol H^+/t) can occur in layers with shell fragments. Fine textured clays elsewhere also generally contain moderate levels of oxidisable sulfur and net acidity (0.31 to1.26%, 214 to 766 mol H^+/t) for the same depth categories, with a higher level (2%, 1300 mol H^+/t) recorded at one sampling site.

S0S1$_N$ (PASS layer within 0.5m depth, PASS layer 0.5 to 1m depth with carbonate materials)

Potential acid sulfate soils occur in the supratidal flat and in the silty clay sediments underlying the shell levee along the bank of Casuarina Creek at Port Alma (Figure 8). The soil profile of the supratidal flat is essentially a grey clay with a brown surface layer. The level of oxidisable sulfur and net acidity is moderate (0.61%, 421 mol H^+/t) at 0.3 to 0.5m depth. Below 0.5m depth there is no measurable potential acidity in the profile and almost sufficient carbonate material to neutralise the level of oxidisable present (0.5%).

The shell levee deposit has weak profile development with an organic enriched, strongly alkaline, layer of brown shell. Below the shell deposit the buried marine clay has a moderate level of oxidisable sulfur (0.6%) and potential acidity (276 mol H^+/t). Lower greenish grey silty clay layers contain up to 0.77% oxidisable sulfur and no measurable potential acidity.

a0S1 (Strongly acidic layer within 0.5m depth, PASS layer 0.5 to 1m depth)

These map units represent supratidal flats (bare saltpans) and are located at Port Alma. The soils have a thin brown surface layer and a mottled strongly acidic subsoil layer within 0.5m depth of the soil surface. Field pH of the strongly acidic subsoil layer ranges from 4.1 to 4.6 units. The underlying dark grey or greenish grey silty clay substrate is slightly acid to neutral with some organic fragments and occasionally coarse shell.

Oxidisable sulfur and actual acidity levels in the strongly acidic layer are negligible (<0.01% and <14 mol H^+/t). Retained acidity measurement of this layer indicates only one site to exceed the Action Criteria (Ahern *et al*. 1998) requiring treatment. Moderate levels of oxidisable sulfur (0.6 to 1.4%) occur throughout the underlying PASS layers.

S1 (PASS layer 0.5 to 1m depth)

The S1 map units extend from Eight Mile Creek at Bajool to Port Alma and make up 21.66% of the area of potential acid sulfate soils. They are mostly associated with supratidal and intertidal flats forming a complex mosaic pattern of saltpan, mangrove areas and tidal channels adjacent to the larger tidal creeks. Relict mangrove channels of Inkerman Creek (Figure 9) and extensive bare saltpans also form the map unit.

The soils have a moderately thick surface layer of brown or dark greyish brown heavy clay overlying a mottled layer of grey or dark grey medium or heavy clay. These layers grade to

greenish grey or grey clay sediments. The levels of oxidisable sulfur are moderate (<1%) throughout these map units with a range from 0.26 to 2.56%.

a1S2 (Strongly acid layer 0.5 to 1m depth, PASS layer 1 to 2m depth)

A large supratidal flat west of Twelve Mile Creek with some isolated patches of marine couch and samphire, and a small area of supratidal flat with samphires and mangroves west of the Port Alma saltworks comprise this map unit. The soils are structure-less greyish brown or dark grey heavy clays with a moderately thick (1m) strongly acidic subsoil layer (field pH 4.1 to 4.9). The underlying grey or dark grey PASS layer is also strongly acidic with some organic fragments.

Negligible levels of oxidisable sulfur (<0.02%) and actual acidity (<10 mol H^+/t) are recorded for the surface and subsoil layers. Retained acidity measurement of one selected sample of the strongly acidic subsoil layer was negligible (4 mol H^+/t). At sites where the PASS layer was sampled, the levels of oxidisable sulfur range from low to moderate (0.11 to 0.82%).

S2 (PASS layer 1 to 2m depth)

The S2 map units are scattered throughout the survey area from Eight Mile Creek to the Port Alma saltworks, with the largest unit located east of Twelve Mile Creek. The landform is dominantly a supratidal flat but includes intertidal areas with mangrove cover. The soils are grey, dark greyish brown or dark grey structure-less heavy clays, which were mostly not penetrable by gouge auger below 1.5m depth. Deeper sampling in one of the map units by Geoprobe® percussion coring indicates the PASS layer continues to 5m depth where it overlies greenish grey non-sulfidic clay (Figure 10).

The levels of oxidisable sulfur throughout the map units in the upper PASS layers range from very low to moderate (0.03 to 0.78%), with some sites having no measurable potential acidity. The deeper sampling indicates much higher levels of oxidisable sulfur (1.3 to1.6%) from 2.8 to 4.8m depth, and decreasing to 0.49% at 5m depth.

S3 (PASS layer 2 to 3m depth)

This single map unit located in the south west corner of the survey area consists of an elevated plain and a small area of tidal flat adjacent to Inkerman Creek. The vegetation is dominantly marine couch with patches of samphire. A small clump of blue-gum trees occur within the unit. The soils are well structured greyish brown heavy clays with a black surface layer. Organic fragments are present in the saturated greenish grey PASS layer below 2m depth. Negligible levels of oxidisable sulfur (<0.02%) are recorded for samples to 2m depth. The levels of oxidisable sulfur and net acidity at 2.8 to 3m depth range from 0.77 to 1.03% and 416 to 600 mol H^+/t, respectively.

Figure 8. Shell deposit Casuarina Creek, $S0S1_N$ map unit.

Figure 9. Relict mangrove channel, Inkerman Creek, S1 map unit.

Figure 10. PASS layer overlying non-sulfidic clay, S2 map unit.

4.3 *Acid Sulfate on Relatively Undisturbed Land*

S_{LA} (Limited field assessment and landform indicating ASS)

The S_{LA} map unit contains tidal channels, intertidal flats and supratidal flats indicating the presence of acid sulfate soils. Much of the unit is bounded by Casuarina Creek and pondage banks of the Port Alma saltworks. Limited sampling was undertaken along a narrow intertidal flat with mangrove cover near the eastern boundary of the map unit.

The intertidal flat had acid sulfate soil layers at 0.4 to 0.6m depth with moderate levels of oxidisable sulfur (0.4%), increasing to 1.3% below 1m depth. Sampling from a more elevated tidal creek bank indicates that acid sulfate soil layers occur at greater depth (>1m) with similar levels of oxidisable sulfur (0.5%).

4.4 *Acid Sulfate on Disturbed Land*

S_{DL} (Disturbed land likely to contain acid sulfate soils)

These map units represent the extensive area occupied by saltworks and a small area with port facilities at Port Alma, and total 2,979.1 ha in area. The surrounding landform and nearby occurrence of acid sulfate soils would indicate their likely presence within these disturbed lands. Sampling is restricted to a few locations outside of the salt concentrating ponds (Figure 11).

Deep sampling at the Bajool production plant indicates an actual acid sulfate soil layer with jarosite, within fine sandy sediments from 2.2 to 4.3m depth overlying pale brown coarse sand to 10.8m depth. Negligible levels of oxidisable sulfur (<0.02%) actual and potential acidity (<10 mol H^+/t) are recorded throughout the sediment profile, and for the actual acid sulfate soil layer. The actual acid sulfate soil layer contains a very low level of retained acidity (20 to 46 mol H^+/t) and is almost fully oxidised.

Within this map unit an actual acid sulfate soil layer occurs within the soil surface layer of a tidal drainage channel between embankments at the Port Alma saltworks (Figure 12). The underlying potential acid sulfate soil layers contain variable levels of oxidisable sulfur and shell fragments to 4.8m depth. Net acidity for these layers range from <10 to 535 mol H^+/t.

Sampling on the tidal flat behind the salt stockpile and buildings at Port Alma indicates acid sulfate soils are likely to underlie the port facilities. Moderate levels of oxidisable sulfur (1.3%) and potential acidity (712 mol H^+/t) were found in clay sediment to 2m depth. Shelly sediment at 3m depth contained 0.7% oxidisable sulfur and no measurable potential acidity.

Figure 11. Salt concentrating pond, Port Alma, S_{DL} map unit.

Figure 12. Tidal drainage channel, Port Alma, S_{DL} map unit.

4.5 *Land with a Low Probability of Acid Sulfate Soil Occurrence*

LP (Land predominantly < 5m AHD with low probability of ASS occurrence)

Relatively small areas of alluvial plain and tidal flat comprise this map unit. Most are located in the south west corner of the survey area. The soils associated with the alluvial plains are dark greyish brown or black cracking clays with normal gilgai micro-relief and are non-acid sulfate soils to the depth sampled (3.5m). Acid sulfate soil with 0.2% oxidisable sulfur was recorded in a drainage line in the map unit adjoining Eight Mile Creek, but was too small to separate at the scale of mapping. Dark grey heavy clays occur within the tidal flat areas usually with angular gravels in the substrate below 1.5m depth. The levels of oxidisable sulfur are negligible (< 0.01%) and net acidity (< 10 mol H^+/t) to the depth sampled (2.6m).

5. Water Quality Monitoring

Six piezometers or shallow groundwater monitoring bores were installed to determine the characteristics of the shallow groundwater draining into the estuary (Figure 13). During installation of the six piezometers watertable depth ranged from 0.8 to 3m. Despite the high clay content of the soils and dry conditions over the sampling period, the piezometers have yielded adequate water for sampling. Two piezometers are located within the Twelve Mile Creek Reserve, one along Hourigan Creek and Raglan Creek within the Raglan Racecourse Reserve, and one at Inkerman and Eight Mile Creeks.

The piezometers are installed in acid sulfate soils, two of these soils containing actual acid sulfate soil layers (piezometers D and F). The soil profile at each site has been sampled for a comprehensive chemical analysis to assist in the interpretation of the water quality results. Field testing and water sampling was undertaken on a monthly basis since September 2006. Field tests are pH, Electrical Conductivity (EC) and Dissolved Oxygen (DO).

Field results (Table 2) indicate very low to low dissolved oxygen (1.8 to 12.1% saturation) in all of the standing waters of the bores since November 2006. Slightly acidic water (field pH 5.5 to 5.9) is associated with piezometer F. The waters are brackish or have elevated conductivity readings (27.6 to 116.4 dS/m).

Figure 13. Installation of piezometer F, Eight Mile Creek.

Table 2. Field measurements of shallow groundwater monitoring bores.

Piezometer	Locality	Date sampled	pH	EC (dS/m)	DO (%sat)
A	Hourigan Creek	26-09-06	6.8	33.6	5.3
		27-10-06	6.9	42.5	2.4
		20-11-06	6.8	40.9	3.1
		19-12-06	6.7	49.8	2.2
		5-02-07	6.9	54.1	3.3
		26-02-07	6.8	56.2	2.4
B	Raglan Creek	26-09-06	6.6	32.4	11.7
		27-10-06	6.6	42.3	14.4
		20-11-06	7.0	40.0	12.1
		19-12-06	6.6	50.0	3.3
		17-01-07	6.7	44.3	4.5
		26-02-07	6.7	44.6	3.5
C	Twelve Mile Creek	26-09-06	6.9	28.9	36.1
		27-10-06	6.8	37.2	31.6
		20-11-06	6.7	34.6	11.4
		19-12-06	6.7	37.2	5.8
		5-02-07	6.9	40.8	5.3
		26-02-07	6.7	41.5	4.8
D	Twelve Mile Creek	26-09-06	6.5	27.6	2.5
		27-10-06	6.4	36.3	2.9
		20-11-06	6.5	35.3	3.4
		19-12-06	6.5	38.2	1.8
		5-02-07	6.6	38.1	5.0
		26-02-07	6.7	38.7	3.6
E	Inkerman Creek	26-09-06	6.7	52.2	13.6
		27-10-06	6.7	68.8	11.7
		20-11-06	6.5	60.0	5.1
		19-12-06	6.5	75.8	5.3
		5-02-07	6.7	77.6	6.8
		26-02-07	6.6	74.1	4.2
F	Eight Mile Creek	26-09-06	5.7	82.7	9.0
		27-10-06	5.5	107.3	7.6
		20-11-06	5.5	89.2	5.9
		19-12-06	5.7	115.3	5.0
		5-02-07	5.6	114.1	4.8
		26-02-07	5.9	116.4	5.4

6. Discussion

The acid sulfate soils throughout the survey area generally contain moderate levels of peroxide oxidisable sulfur (<1.5%) and acid generation potential (<1000 mol H^+/t). These levels are significantly lower in comparison with levels recorded in the nearby Narrows area (Ross 2005), and at Gladstone and Yeppoon (Ross 2003, 2004), within similar landforms. Low amounts of organic materials in the soil profiles and the dominance of grey and river mangroves are characteristics of this survey area and may provide an explanation for the lower levels of sulfides in the area.

Since much of the survey area consists of saltpans (supratidal flats), the dominant soil type would normally be expected to be an actual acid sulfate soil as is common on dry tropics saltpans throughout the southern Central Queensland coast. The area occupied by actual acid sulfate soils is 1,325ha or 12.9%. The local watertable is likely to be a significant determinant in preventing the oxidation of sulfides in areas where actual acid sulfate soils are absent. Likewise the high clay content of these soils (70 to 80%) may prevent drying and sulfide oxidation.

The acid sulfate soils of the area are wet with a shallow watertable, and are classified within the Australian Soil Classification (Isbell 1996) as Hydrosols. Sulfidic Hydrosols or potential acid sulfate soils are dominant throughout the survey area. Sulfuric Hydrosols, containing both actual and potential acid sulfate soil layers are associated with some of the supratidal flats (saltpans) and the slightly elevated marine couch flats (extratidal flats). Other soil orders in the survey area overlying acid sulfate soils are Vertosols and Dermosols.

The depth to the acid sulfate soil layer on these tidal flats is less predictable than occurs elsewhere on tidal flats along the southern Central Queensland coast. The intertidal flats or mangrove mudflats contain clay levees along the tidal channels at several locations and are slightly elevated in relation to the adjacent saltpan or supratidal flat. Consequently the depth to the potential acid sulfate soil layer is greater at these locations. The depth to the acid sulfate soil layer on the supratidal flats or saltpans can be quite variable ranging from 0.4 to 1.8m without any surface indicators. This variable depth may be the result of channel infill.

Wind erosion occurs on the extensive areas of bare saltpan or supratidal flat south of Inkerman Creek (Figure 14). With wetting and drying from rainfall or tidal inundation, the resulting fine granular surface layer is susceptible to wind erosion. Some of the wind transported material has formed clay veneers on the saltpans which have been colonised by vegetation over time. The outer elevated margin of the clay veneer enhances water and nutrient retention.

Saltworks in the area commenced operation in 1958 using underground natural brines. It is likely most of the saltworks are situated on former saltpan and mangrove mudflat and contain acid sulfate soils. If acid sulfate soils were disturbed during construction of the pond walls there is currently no evidence of the effects of disturbance around these walls.

Figure 14. Wind erosion, Inkerman Creek.

The Laboratory Methods Guidelines (Ahern *et al*. 2004) use an acid base accounting approach for predicting Net Acidity from sulfide oxidation of acid sulfate soils. For this survey, net acidity (moles H^+/tonne) is calculated as follows and the results listed in Appendix 1:

pH KCL $\geq$ 6.5, Net Acidity = 623.7 x S_{POS} – (332.7 x CaA + 548.4 x MgA);

pH KCL < 6.5, Net Acidity = 623.7 x S_{POS} + TAA + (467.8 x S_{NAS});

pH KCL < 6.5, Net Acidity = 623.7 x S_{POS} + TAA.

Calculated Net Acidity is generally higher than the measured Titratable Peroxide Acidity and in some samples the difference is substantial. For example, site CQA973 1.6-1.8m depth sample (Appendix 1) has a calculated Net Acidity of 269 mol H^+/t greater than the measured Titratable Peroxide Acidity. The complexity of acid sulfate soil chemistry, and reasons why acidity measured by titration methods are not consistent with acidity predicted from sulfur analysis, are outlined in the Acid Sulfate Soil Laboratory Methods Guidelines (Ahern *et al*. 2004). These differences are possibly due to organic matter and organic acidity effects, or there may be acid neutralising components in the soils other than calcium and magnesium.

Thirty six samples with marked differences between net acidity and titratable peroxide acidity were analysed for chromium reducible sulfur and acid neutralising capacity (Table 3). The chromium reducible sulfur (S_{CR}) results indicate peroxide oxidisable sulfur (S_{POS}) is not elevated by organic sulfur in the selected samples. The acid neutralising capacity (ANC_{BT}) results indicate the presence of other neutralising components in these samples, other than reacted calcium and magnesium determined by the SPOCAS method.

Table 3. Peroxide oxidisable sulfur, chromium reducible sulfur, and acid neutralising capacity for selected depth samples.

Site No	Depth (m)	S_{POS} [1] (%)	S_{CR} [2] (%)	ANC_{BT} [3] (% $CaCO_3$)
CQA853	1.6-1.8	0.82	0.87	2.2
CQA854	0.5-0.7	0.72	0.68	2.1
CQA857	1.6-1.8	0.39	0.36	2.0
CQA859	1.6-1.8	1.22	1.19	5.4
CQA861	1.0-1.2	1.08	1.07	2.6
CQA861	1.6-1.8	0.70	0.75	2.3
CQA864	1.6-1.8	0.35	0.37	1.7
CQA881	0.8-1.0	<0.01	<0.02	<0.5
CQA893	0.4-0.6	<0.01	<0.02	<0.5
CQA897	0.8-1.0	0.57	0.66	1.7
CQA897	1.6-1.8	0.58	0.65	2.2
CQA907	1.3-1.5	0.62	0.53	1.5
CQA909	1.5-1.8	1.19	1.00	0.6
CQA924	1.8-2.0	0.85	1.01	<0.5
CQA924	2.8-3.0	0.45	0.56	1.5
CQA936	1.5-1.8	1.08	1.05	2.3
CQA939	0.7-0.9	<0.01	<0.02	<0.5
CQA940	1.0-1.2	<0.01	<0.02	<0.5
CQA940	1.5-1.8	0.27	0.27	<0.5
CQA942	0.46-0.6	0.54	0.54	1.8
CQA942	0.7-0.9	0.91	0.92	3.5
CQA944	0.8-1.0	0.82	0.81	2.1
CQA944	1.5-1.8	0.73	0.71	2.3
CQA945	1.5-1.8	1.31	1.16	1.6
CQA946	1.5-1.8	0.86	0.82	1.5
CQA948	0.8-1.0	1.09	1.10	2.4
CQA949	1.0-1.2	0.34	0.43	1.5
CQA951	1.5-1.8	0.52	0.45	1.8
CQA953	3.8-4.0	0.60	0.63	1.7
CQA953	4.0-4.3	0.98	1.00	2.1
CQA958	1.5-1.8	0.37	0.37	0.8
CQA964	0.8-1.0	1.11	1.03	1.2
CQA970	1.2-1.4	0.32	0.37	1.0
CQA971	1.6-1.8	1.18	1.03	1.8
CQA973	1.6-1.8	1.22	1.14	3.9
CQA977	1.6-1.8	0.82	0.75	2.6

[1] Peroxide oxidisable sulfur (Ahern *et al*. 2004).

[2] Chromium reducible sulfur (Ahern *et al*.2004).

[3] Acid Neutralising Capacity Back Titration (Ahern *et al*. 2004).

The accompanying acid sulfate soil map is essentially a map of *depth* to the acid sulfate soil layers. An indication of risk, depending on the type and extent of disturbance, can be inferred from the depth to an actual acid sulfate soil and/or potential acid sulfate soil layer. For example, draining land with potential acid sulfate soil layers at very shallow depth (<0.5m), within the S0 mapping units would be considered a high risk activity. However the map units provide no indication of the levels of sulfides, actual acidity or acid generation potential provided at 1:50 000 scale mapping. Mapping units with the same depth code can contain quite variable levels of sulfides, existing and potential acidity and consequently varying levels of risk.

Acid sulfate soil risk maps which predict the distribution of acid sulfate soils, based on an assessment of the geomorphic environment, have been produced for coastal areas of New South Wales (Flewin *et al*. 1996). The maps identify the areas at risk and likely depth to the occurrence of acid sulfate soils. Three risk classes are used (High, Low and No Known Occurrence) and these can be related to land use activities that may expose acid sulfate soils, creating an environmental risk. Unlike risk maps, hazard maps are based on more objective criteria with limited interpretation.

The potential acid generation of particular areas of land is illustrated on the accompanying acid sulfate soil *hazard* map. Four classes of acid generation potential are used (Very Low, Low, Moderate and High) based on the concentration of sulfides (peroxide oxidisable sulfur content, S_{POS}) and corresponding acid generation potential (Net Acidity). Criteria used to establish the classes are given in Table 4.

Table 4. Acid sulfate hazard classes.

Class	**Criteria**
Very Low	S_{POS} <0.03% and Net Acidity = 18 to 80 mol H^+/t S_{POS} >0.03% and Net Acidity = 0 to <18 mol H^+/t Low probability areas
Low	S_{POS} >0.03% and Net Acidity ≥ 18 to 200 mol H^+/t
Moderate	S_{POS} >0.35% and Net Acidity ≥ 200 to <1000 mol H^+/t
High	S_{POS} >1.5% and Net Acidity >1000 mol H^+/t

Depth to the acid sulfate soil layer is not used in the class criteria because the higher concentrations of sulfides and acid generation potential mostly occur at shallow depth and are associated with clayey sediments. Lower concentrations of sulfides and lower acid generation potential can occur at greater depth and can be associated with sandy or shelly sediments. For convenience of use, the depth to the acid sulfate soil layer with significant potential acidity has been placed on the mapping units of the hazard map. The hazard map should be read in conjunction with the accompanying acid sulfate soil map.

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APPENDIX 1

SPOCAS data for samples at selected depths

ABBREVIATIONS

S_{POS} Peroxide oxidisable sulfur

TAA Titratable actual acidity

TPA Titratable peroxide acidity

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
853	0.4-0.6	Port Alma	Supratidal	0.67	42	420	463
	0.8-1.0		Flat	0.74	<10	327	432
	1.6-1.8			0.82	<10	97	315
854	0.5-0.7	Port Alma	Supratidal	0.72	<10	74	294
	0.8-1.0		Flat	1.57	<10	687	870
	1.6-1.8			1.63	<10	714	904
855	0.4-0.6	Port Alma	Intertidal	0.22	<10	<10	110
	0.8-1.0		Flat	1.42	<10	791	894
	1.6-1.8			0.95	<10	442	547
856	0.4-0.6	Port Alma	Supratidal	0.82	<10	440	519
	0.8-1.0		Flat	0.80	<10	398	482
	1.6-1.8			1.47	<10	869	925
857	0.8-1.0	Port Alma	Supratidal	0.09	<10	<10	31
	1.2-1.4		Flat	0.11	<10	<10	39
	1.6-1.8			0.39	<10	<10	122
858	0.4-0.6	Port Alma	Supratidal	0.97	24	578	631
	0.8-1.0		Flat	0.96	<10	518	608
	1.6-1.8			1.03	<10	356	523
859	0.7-0.9	Port Alma	Intertidal	0.68	<10	269	353
	1.0-1.2		Flat	0.69	<10	167	335
	1.6-1.8			1.22	<10	<10	363
860	0.4-0.6	Port Alma	Supratidal	0.09	<10	<10	36
	0.8-1.0		Flat	0.31	<10	119	204
	1.6-1.8			0.84	<10	357	468
861	0.6-0.8	Port Alma	Intertidal	0.07	<10	<10	18
	1.0-1.2		Flat	1.08	<10	213	486
	1.6-1.8			0.70	<10	80	282
862	0.5-0.7	Port Alma	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.57	<10	240	329
	1.6-1.8			1.16	<10	661	697
863	0.3-0.5	Port Alma	Supratidal	0.02	<10	<10	21
	0.8-1.0		Flat	0.84	<10	445	534
	1.0-1.2			0.88	<10	317	457
	1.6-1.8			0.80	<10	225	391
864	0.8-1.0	Port Alma	Supratidal	<0.01	<10	<10	<10
	1.0-1.2		Flat	0.26	<10	<10	76
	1.6-1.8			0.35	<10	14	156
865	0.6-0.8	Port Alma	Supratidal	0.01	<10	<10	<10
	1.0-1.2		Flat	0.06	<10	<10	<10
	1.6-1.8			0.22	<10	<10	65
866	0.2-0.4	Port Alma	Intertidal	0.11	<10	<10	50
	0.5-0.7		Flat	0.87	<10	416	492
	1.0-1.2			0.38	<10	109	206
	1.6-1.8			1.16	<10	617	675
867	0.4-0.6	Port Alma	Supratidal	1.06	<10	652	669
	0.8-1.0		Flat	0.91	<10	512	579
	1.6-1.8			0.99	<10	541	630
868	0.8-1.0	Port Alma	Supratidal	0.42	<10	157	236
	1.3-1.5		Flat	0.94	<10	428	537
	1.6-1.8			1.12	<10	532	642

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
869	0.4-0.6	Port Alma	Supratidal	0.07	<10	<10	37
	0.8-1.0		Flat	0.59	<10	196	305
	1.6-1.8			1.03	<10	318	521
870	0.5-0.7	Bajool	Supratidal	0.61	<10	263	372
	0.9-1.1		Flat	1.26	<10	659	766
	1.6-1.8			1.44	<10	788	862
871	0.3-0.5	Bajool	Supratidal	0.02	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	<10
	1.6-1.8			0.04	<10	<10	<10
872	0.3-0.5	Bajool	Supratidal	0.70	<10	256	380
	0.8-1.0		Flat	2.09	<10	1256	1290
	1.6-1.8			0.87	<10	339	483
873	.15-0.3	Bajool	Supratidal	0.27	<10	125	180
	0.3-0.5		Flat	0.68	21	393	442
	0.8-1.0			1.52	13	921	962
	1.6-1.8			1.69	<10	958	1070
874	0.3-0.5	Bajool	Supratidal	0.06	16	36	53
	0.8-1.0		Flat	0.01	18	16	27
	1.6-1.8			1.20	<10	609	726
875	0.4-0.6	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	<10
	1.3-1.5			<0.01	<10	<10	<10
876	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	1.6-1.8		Flat	0.26	<10	<10	105
877	0.3-0.5	Bajool	Supratidal	<0.01	13	<10	16
	0.6-0.8		Flat	<0.01	20	12	23
	1.0-1.2			<0.01	<10	<10	<10
	1.6-1.8			0.68	<10	322	387
878	0.4-0.6	Bajool	Supratidal	<0.01	49	19	86
	0.8-1.0		Flat	0.01	38	11	43
	1.6-1.8			0.43	<10	175	254
879	0.5-0.7	Bajool	Supratidal	<0.01	28	<10	31
	0.8-1.0		Flat	<0.01	25	<10	28
	1.1-1.3			0.04	<10	<10	22
	1.6-1.8			0.67	<10	309	386
880	0.6-0.8	Bajool	Extratidal	<0.01	<10	<10	<10
	1.0-1.2		Flat	<0.01	<10	<10	<10
	1.6-1.8			<0.01	<10	<10	<10
881	0.4-0.6	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	29	<10	84
	1.6-1.8			<0.01	23	<10	26
882	0.3-0.5	Bajool	Drainage	<0.01	<10	<10	13
	0.8-1.0		Depression	<0.01	32	11	37
	1.3-1.5			<0.01	24	<10	27
	1.6-1.8			0.04	21	11	46
883	0.4-0.6	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	<0.01	<10	<10	13
	1.6-1.8			0.15	<10	<10	43

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
884	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	13
	1.3-1.5			0.08	24	44	73
	1.6-1.8			1.16	<10	665	736
885	0.7-0.9	Bajool	Supratidal	<0.01	<10	<10	<10
	1.6-1.8		Flat	<0.01	<10	<10	<10
	2.4-2.6			<0.01	<10	<10	<10
886	0.3-0.5	Bajool	Supratidal	<0.01	12	<10	15
	0.8-1.0		Flat	0.56	63	371	441
	1.3-1.5			1.31	11	725	828
	2.0-2.2			1.20	<10	571	719
	2.8-3.0			0.85	<10	323	471
887	0.8-1.0	Inkerman	Tidal	<0.01	10	<10	13
	1.8-2.0	Creek	Creek	0.63	<10	277	401
	2.8-3.0			1.55	<10	850	975
888	0.8-1.0	Twelve Mile	Stream	0.02	<10	<10	20
	1.8-2.0	Creek	Channel	<0.01	<10	<10	13
	2.8-3.0			<0.01	<10	<10	13
889	0.7-0.9	Twelve Mile	Drainage	<0.01	<10	<10	<10
	1.3-1.5	Creek	Depression	<0.01	<10	<10	13
	2.2-2.4			<0.01	34	21	38
	2.8-3.0			0.43	11	215	282
890	0.8-1.0	Twelve Mile	Alluvial	<0.01	<10	<10	13
	1.8-2.0	Creek	Plain	<0.01	<10	<10	13
	2.8-3.0			<0.01	<10	<10	13
891	0.8-1.0	Twelve Mile	Stream	<0.01	<10	<10	<10
	1.8-2.0	Creek	Channel	<0.01	<10	<10	<10
892	0.4-0.6	Bajool	Marine	<0.01	24	14	397
	1.3-1.5		Plain	<0.01	25	14	46
	2.0-2.2			0.30	<10	135	194
	2.5-2.7			0.46	<10	124	268
893	0.4-0.6	Bajool	Marine	<0.01	29	13	39
	0.6-0.8		Plain	<0.01	34	18	182
	1.3-1.5			<0.01	47	63	50
	1.8-2.0			0.99	13	585	628
	2.5-2.7			0.78	<10	301	457
894	1.8-2.0	Bajool	Alluvial	<0.01	<10	<10	<10
	2.8-3.0		Plain	<0.01	<10	<10	<10
895	0.5-0.7	Inkerman	Supratidal	0.01	<10	<10	<10
	0.8-1.0	Creek	Flat	0.17	<10	46	99
	1.6-1.8			1.00	<10	567	633
896	0.4-0.6	Inkerman	Supratidal	<0.01	14	<10	17
	0.8-1.0	Creek	Flat	0.01	<10	<10	18
	1.6-1.8			0.20	<10	104	134
897	0.1-0.3	Inkerman	Tidal	1.22	<10	544	687
	0.4-0.6	Creek	Creek	1.16	<10	593	692
	0.8-1.0			0.57	<10	122	311
	1.6-1.8			0.58	<10	56	290
898	0.3-0.5	Inkerman	Supratidal	<0.01	<10	<10	<10
	0.8-1.0	Creek	Flat	<0.01	<10	<10	<10
	1.5-1.7			0.21	<10	101	140

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
899	0.2-0.3	Inkerman	Supratidal	0.02	<10	<10	21
	0.3-0.5	Creek	Flat	1.34	23	773	859
	0.8-1.0			1.69	56	1033	1110
	1.6-1.8			1.12	<10	561	709
900	0.9-1.1	Inkerman	Supratidal	1.16	13	633	739
	1.3-1.5	Creek	Flat	1.25	<10	623	789
	1.5-1.7			1.40	17	750	883
901	0.6-0.8	Inkerman	Supratidal	0.15	<10	<10	34
	0.8-1.0	Creek	Flat	0.15	<10	<10	<10
	1.4-1.6			0.23	<10	<10	34
902	0.3-0.5	Port Alma	Supratidal	0.01	<10	<10	18
	0.8-1.0		Flat	0.13	<10	<10	34
	1.3-1.5			0.15	<10	<10	40
903	0.5-0.7	Port Alma	Supratidal	0.75	<10	324	477
	0.9-1.1		Flat	0.71	<10	286	451
	1.6-1.8			1.51	13	826	956
904	0.3-0.5	Bajool	Supratidal	0.02	<10	<10	<10
	0.6-0.8		Flat	0.09	<10	<10	<10
	0.8-1.0			0.10	<10	<10	<10
905	0.3-0.5	Casuarina	Supratidal	0.02	<10	<10	<10
	0.7-0.9	Creek	Flat	0.93	<10	450	589
	1.2-1.4			0.70	<10	272	391
906	0.4-0.6	Bajool	Supratidal	1.56	30	900	1000
	0.9-1.1		Flat	1.58	19	876	1000
	1.6-1.8			1.38	16	778	874
907	0.4-0.6	Bajool	Supratidal	0.01	<10	<10	<10
	1.0-1.2		Flat	0.17	<10	<10	40
	1.3-1.5			0.62	<10	134	281
908	0.3-0.5	Casuarina	Supratidal	0.02	<10	<10	<10
	0.8-1.0	Creek	Flat	0.02	<10	<10	<10
	1.2-1.5			0.10	<10	<10	38
909	0.6-0.8	Bajool	Supratidal	1.83	15	1033	1150
	1.0-1.2		Flat	2.64	26	1442	1670
	1.5-1.8			1.19	<10	586	749
910	0.4-0.6	Bajool	Supratidal	0.02	<10	<10	23
	0.6-0.8		Flat	1.20	42	695	791
	1.0-1.2			1.30	<10	684	821
	1.6-1.8			1.19	<10	623	753
911	0.6-0.8	Inkerman	Supratidal	0.02	<10	<10	<10
	1.0-1.2	Creek	Flat	0.92	<10	419	582
	1.6-1.8			1.26	<10	635	794
912	0.5-0.7	Bajool	Supratidal	0.01	<10	<10	19
	0.9-1.05		Flat	0.53	30	270	361
	1.4-1.6			0.68	<10	248	369
913	0.4-0.6	Bajool	Supratidal	0.01	<10	<10	13
	0.8-1.0		Flat	0.15	<10	12	55
	1.2-1.4			0.15	<10	<10	61
914	0.6-0.8	Inkerman	Supratidal	0.01	19	14	28
	1.0-1.2	Creek	Flat	0.02	26	14	47
	1.6-1.8			1.06	33	600	695

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
915	0.5-0.7	Port Alma	Supratidal	0.71	<10	13	271
	0.8-1.0		Flat	0.92	<10	88	342
	1.6-1.8			0.98	<10	214	456
916	0.6-0.8	Port Alma	Supratidal	0.11	<10	<10	64
	0.9-1.1		Flat	0.64	<10	297	411
	1.6-1.8			0.79	<10	353	500
917	0.4-0.6	Inkerman	Supratidal	0.87	51	500	596
	0.8-1.0	Creek	Flat	0.77	<10	334	448
	1.5-1.8			1.27	<10	644	805
918	0.0-0.1	Bajool	Swamp	0.06	12	<10	51
	0.3-0.5			0.01	<10	<10	16
	0.8-1.0			<0.01	<10	<10	13
	1.2-1.5			<0.01	20	13	24
919	0.2-0.4	Bajool	Supratidal	0.04	19	31	41
	0.5-0.7		Flat	0.07	26	37	69
	0.8-1.0			1.05	16	550	610
	1.5-1.8			1.01	<10	513	643
920	0.3-0.5	Inkerman	Extratidal	<0.01	<10	<10	<10
	0.8-1.0	Creek	Flat	<0.01	33	20	39
	1.5-1.8			0.79	20	424	515
921	0.7-0.9	Inkerman	Supratidal	1.23	14	680	778
	1.0-1.2	Creek	Flat	1.52	<10	864	960
	1.5-1.8			1.29	20	734	823
922	0.4-0.6	Bajool	Extratidal	<0.01	<10	<10	13
	1.0-1.2		Flat	<0.01	28	17	32
	1.8-2.0			<0.01	46	25	113
	2.3-2.5			0.66	22	396	435
	2.8-3.0			1.10	<10	550	606
923	1.0-1.2	Inkerman	Extratidal	<0.01	<10	<10	13
	1.8-2.0	Creek	Flat	<0.01	<10	<10	13
	2.7-2.9			<0.01	15	<10	18
924	0.8-1.0	Bajool	Drainage	<0.01	20	<10	23
	1.3-1.5		Depression	<0.01	23	18	84
	1.8-2.0			0.85	36	537	570
	2.8-3.0			0.45	<10	84	245
925	0.3-0.5	Inkerman	Supratidal	<0.01	<10	<10	13
	0.8-1.0	Creek	Flat	1.57	110	1134	1150
	1.6-1.8			1.34	16	796	853
926	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.50	55	355	452
	1.5-1.8			0.71	<10	296	410
927	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	13
	1.2-1.4			0.49	<10	237	317
928	0.4-0.6	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.40	<10	163	261
	1.5-1.8			0.56	<10	230	327
929	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	0.74	<10	393	473
	1.5-1.8			1.12	20	658	721

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
930	0.4-0.6	Bajool	Supratidal	<0.01	23	<10	270
	0.8-1.0		Flat	<0.01	26	<10	196
	1.6-1.8			0.55	13	269	356
931	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	<0.01	<10	<10	13
	1.6-1.8			0.17	<10	<10	79
932	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.43	<10	217	280
	1.6-1.8			0.70	<10	315	446
933	0.6-0.8	Casuarina	Intertidal	1.49	12	826	943
	1.1-1.3	Creek	Flat	1.24	<10	624	785
	1.6-1.8			1.15	<10	562	728
934	0.7-0.9	Bajool	Supratidal	0.40	<10	137	217
	1.1-1.3		Flat	1.55	10	844	976
	1.6-1.8			2.45	<10	1360	1500
935	0.5-0.7	Casuarina	Supratidal	1.47	82	945	1000
	1.0-1.2	Creek	Flat	1.36	26	771	873
	1.6-1.8			0.82	<10	396	524
936	0.3-0.5	Casuarina	Intertidal	0.17	<10	<10	44
	0.8-1.0	Creek	Flat	1.53	<10	484	780
	1.5-1.8			1.08	<10	279	520
937	0.6-0.8	Casuarina	Intertidal	0.15	<10	<10	78
	1.0-1.2	Creek	Flat	0.42	<10	168	242
	1.5-1.8			0.90	<10	435	534
938	0.3-0.5	Bajool	Plain	<0.01	16	<10	19
	0.8-1.0			<0.01	18	<10	21
	1.6-1.9			<0.01	51	33	72
939	0.3-0.5	Bajool	Plain	0.01	<10	<10	17
	0.7-0.9			<0.01	22	10	200
	1.6-1.8			<0.01	38	19	44
940	0.3-0.5	Bajool	Plain	<0.01	41	19	45
	1.0-1.2			<0.01	81	84	382
	1.5-1.8			0.27	150	350	598
941	0.3-0.5	Casuarina	Intertidal	1.14	<10	559	655
	0.8-1.0	Creek	Flat	1.32	14	765	839
	1.5-1.8			1.28	<10	553	730
942	0.46-0.6	Casuarina	Supratidal	0.54	<10	10	202
	0.7-0.9	Creek	Flat	0.91	<10	10	284
	1.5-1.8			0.31	<10	<10	<10
943	0.6-0.8	Casuarina	Supratidal	0.03	<10	<10	<10
	1.1-1.3	Creek	Flat	0.11	14	33	80
	1.5-1.8			1.02	47	573	681
944	0.4-0.6	Casuarina	Supratidal	0.76	<10	354	486
	0.8-1.0	Creek	Flat	0.82	<10	103	345
	1.5-1.8			0.73	<10	31	263
945	0.2-0.4	Port Alma	Supratidal	<0.01	<10	<10	<10
	0.5-0.7		Flat	0.66	<10	350	421
	1.0-1.2			0.94	<10	372	527
	1.5-1.8			1.31	<10	447	702

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
946	0.4-0.6	Port Alma	Supratidal	0.75	10	389	478
	0.8-1.0		Flat	0.66	<10	291	422
	1.5-1.8			0.86	<10	247	438
947	0.6-0.8	Casuarina	Tidal	0.08	<10	<10	38
	1.0-1.2	Creek	Creek	0.65	<10	330	389
	1.5-1.8			1.20	<10	693	725
948	0.4-0.6	Port Alma	Supratidal	0.99	21	599	636
	0.8-1.0		Flat	1.09	<10	217	459
	1.5-1.8			0.53	<10	<10	24
949	0.5-0.7	Port Alma	Supratidal	0.33	<10	163	219
	1.0-1.2		Flat	0.34	<10	38	163
	1.5-1.8			0.33	<10	<10	84
950	0.3-0.5	Port Alma	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	<10
	1.5-1.6			<0.01	<10	<10	<10
951	0.6-0.8	Casuarina	Supratidal	0.12	<10	<10	46
	0.8-1.0	Creek	Flat	0.27	<10	<10	73
	1.5-1.8			0.52	<10	22	205
952	0.4-0.6	Port Alma	Supratidal	1.07	<10	559	678
	0.8-1.0		Flat	0.74	<10	344	470
	1.5-1.8			0.37	<10	127	217
953	1.8-2.0	Inkerman	Plain	<0.01	<10	<10	13
	2.8-3.0	Creek		0.02	<10	<10	<10
	3.8-4.0			0.60	<10	107	279
	4.0-4.3			0.98	<10	227	449
954	0.45-0.6	Inkerman	Supratidal	0.02	<10	<10	<10
	0.8-1.0	Creek	Flat	0.02	<10	<10	<10
	1.5-1.8			2.03	<10	1137	1230
955	0.5-0.7	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	0.01	16	<10	19
	1.5-1.8			0.73	<10	304	415
956	0.3-0.5	Inkerman	Supratidal	0.20	<10	<10	24
	0.8-1.0	Creek	Flat	<0.01	<10	<10	13
	1.4-1.6			0.81	31	410	538
957	0.3-0.5	Inkerman	Supratidal	0.20	<10	<10	20
	0.8-1.0	Creek	Flat	<0.01	<10	<10	13
	1.5-1.7			<0.01	10	<10	13
958	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	13
	1.5-1.8			0.37	<10	104	242
959	0.3-0.5	Inkerman	Drainage	0.02	<10	<10	25
	0.8-1.0	Creek	Depression	1.94	45	1186	1250
	1.5-1.8			1.13	<10	532	714
960	0.6-0.8	Bajool	Supratidal	0.04	18	<10	43
	1.0-1.2		Flat	0.03	25	<10	79
	1.7-1.9			0.27	27	143	196
961	0.4-0.6	Bajool	Supratidal	0.03	18	<10	174
	0.8-1.0		Flat	0.01	30	12	97
	1.5-1.8			0.49	<10	214	318
962	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	1.0-1.2		Flat	<0.01	<10	<10	<10

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
963	0.4-0.6	Bajool	Supratidal	0.06	<10	<10	33
	0.8-1.0		Flat	0.88	<10	418	559
	1.5-1.8			1.02	<10	484	645
964	0.3-0.5	Bajool	Supratidal	0.02	<10	<10	25
	0.8-1.0		Flat	1.11	<10	455	621
	1.0-1.2			0.23	<10	17	112
	1.5-1.8			0.06	15	<10	54
965	0.1-0.3	Bajool	Supratidal	<0.01	<10	<10	<10
	0.4-0.6		Flat	<0.01	<10	<10	<10
966	0.3-0.5	Bajool	Supratidal	0.02	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	<10
	1.2-1.4			<0.01	<10	<10	<10
967	0.3-0.5	Bajool	Supratidal	0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	<10
	1.1-1.3			<0.01	<10	<10	<10
968	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	1.34	49	847	887
	1.5-1.8			1.36	<10	767	861
969	0.3-0.8	Inkerman	Supratidal	0.01	<10	<10	<10
	0.8-1.0	Creek	Flat	0.27	<10	99	163
	1.5-1.8			1.11	<10	537	648
970	0.6-0.8	Inkerman	Supratidal	0.05	12	13	44
	1.0-1.2	Creek	Flat	0.51	<10	253	329
	1.2-1.4			0.32	<10	55	167
971	0.4-0.6	Raglan	Supratidal	1.16	<10	490	570
	0.8-1.0	Creek	Flat	1.13	<10	480	580
	1.6-1.8			1.18	<10	398	559
972	0.3-0.5	Port Alma	Supratidal	0.02	12	<10	26
	0.8-1.0		Flat	1.23	<10	597	694
	1.6-1.8			0.81	<10	229	378
973	0.1-0.3	Port Alma	Supratidal	0.02	<10	<10	20
	0.4-0.6		Flat	0.98	40	554	651
	0.8-1.0			1.25	<10	370	560
	1.6-1.8			1.22	<10	36	305
974	0.3-0.5	Port Alma	Supratidal	0.01	<10	<10	17
	0.6-0.8		Flat	0.83	<10	425	525
	1.6-1.8			1.49	<10	700	809
975	0.4-0.6	Port Alma	Supratidal	1.07	<10	479	522
	0.8-1.0		Flat	1.79	12	985	1130
	1.6-1.8			1.30	<10	654	820
976	0.4-0.6	Casuarina	Intertidal	0.86	<10	338	437
	0.8-1.0	Creek	Flat	2.32	<10	1396	1460
	1.6-1.8			2.24	<10	1218	1410
977	0.4-0.6	Port Alma	Supratidal	0.93	<10	457	590
	0.8-1.0		Flat	1.26	<10	544	680
	1.6-1.8			0.82	<10	34	222
978	0.4-0.6	Port Alma	Supratidal	1.75	<10	979	1100
	0.8-1.0		Flat	2.02	<10	1102	1270
	1.6-1.8			1.36	<10	724	855

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
979	0.6-0.8	Casuarina	Levee	0.59	<10	276	377
	1.0-1.2	Creek		0.78	<10	127	319
	1.5-1.8			0.77	<10	<10	234
980	0.3-0.5	Casuarina	Creek	0.04	<10	<10	<10
	0.8-1.0	Creek	Bank	0.03	<10	<10	29
	1.5-1.8			0.50	<10	225	324
981	0.2-0.4	Port Alma	Supratidal	0.02	21	<10	42
	0.8-1.0		Flat	1.73	12	947	1090
	1.5-1.8			0.53	<10	198	242
982	0.3-0.5	Port Alma	Supratidal	0.61	39	345	421
	0.8-1.0		Flat	0.52	<10	<10	77
	1.5-1.8			0.55	<10	<10	20
983	0.4-0.6	Port Alma	Supratidal	0.68	<10	279	326
	0.8-1.0		Flat	0.85	<10	355	387
	1.5-1.8			0.78	<10	348	391
984	0.4-0.6	Casuarina	Intertidal	0.43	<10	57	173
	0.8-1.0	Creek	Flat	1.09	<10	476	593
	1.5-1.8			1.37	<10	620	726
985	0.3-0.5	Port Alma	Supratidal	0.02	<10	<10	<10
	0.8-1.0		Flat	0.29	<10	62	124
	1.5-1.8			1.38	25	785	889
986	0.4-0.6	Casuarina	Supratidal	0.57	<10	198	335
	0.8-1.0	Creek	Flat	0.72	<10	311	459
	1.5-1.8			0.95	16	494	611
987	0.3-0.5	Casuarina	Intertidal	0.22	<10	<10	85
	0.8-1.0	Creek	Flat	1.02	<10	484	649
	1.5-1.8			0.61	<10	264	388
988	0.4-0.6	Casuarina	Intertidal	0.02	<10	<10	<10
	0.8-1.0	Creek	Flat	0.15	<10	<10	83
	1.5-1.8			2.05	20	1172	1300
989	0.3-0.5	Port Alma	Supratidal	<0.01	14	<10	17
	0.8-1.0		Flat	0.37	<10	<10	68
	1.5-1.8			0.49	<10	<10	156
990	0.1-0.3	Port Alma	Supratidal	0.01	14	<10	23
	0.8-1.0		Flat	1.07	32	594	699
	0.5-1.8			1.00	<10	59	317
991	0.2-0.4	Port Alma	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.62	<10	209	291
	1.4-1.6			0.46	<10	<10	106
992	0.4-0.6	Bajool	Supratidal	0.98	<10	479	590
	0.8-1.0		Flat	1.12	<10	468	607
	1.6-1.8			0.93	<10	355	476
993	0.5-0.7	Bajool	Supratidal	1.24	19	644	790
	1.0-1.2		Flat	0.91	<10	237	427
	1.5-1.8			0.62	<10	68	329
994	0.3-0.5	Bajool	Supratidal	0.18	29	105	144
	0.8-1.0		Flat	0.58	<10	121	242
	1.5-1.8			1.19	37	104	778
995	1.5-1.7	Bajool	Extratidal	0.02	36	33	192
	2.0-2.2		Flat	<0.01	42	20	46
	2.6-2.8			0.49	<10	375	298

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
996	0.8-1.0	Bajool	Tidal	0.04	<10	<10	19
	1.3-1.5		Creek	0.09	<10	<10	38
	1.8-2.0			0.48	<10	155	265
	2.8-3.0			0.41	<10	10	178
997	0.8-1.0	Hourigan	Tidal	1.01	<10	506	597
	1.3-1.5	Creek	Creek	1.27	<10	641	750
	1.8-2.0			1.02	<10	458	585
	2.8-3.1			1.56	<10	836	932
998	1.1-1.3	Raglan	Supratidal	1.32	<10	758	806
	1.8-2.0	Creek	Flat	1.98	<10	1185	1210
	2.2-2.5			1.69	<10	925	1030
	2.8-3.1			0.71	<10	195	380
999	2.7-3.0	Twelve	Plain	0.01	<10	<10	<10
	3.4-3.8	Mile Creek		0.62	<10	<10	240
	4.0-4.8			0.62	<10	222	339
	5.5-6.0			0.16	<10	10	<10
1000	2.3-2.6	Twelve	Drainage	0.01	30	13	37
	2.8-3.0	Mile Creek	Depression	0.54	<10	168	286
	3.8-4.0			0.42	<10	100	289
1001	1.5-1.8	Bajool	Extratidal	0.01	30	13	41
	2.3-2.6		Flat	0.55	18	314	361
	3.0-3.3			0.72	<10	249	398
1002	0.2-0.4	Bajool	Supratidal	0.04	31	<10	205
	0.8-1.0		Flat	0.02	42	13	189
	1.5-1.8			1.79	55	1160	1170
1003	0.8-1.0	Bajool	Supratidal	0.03	<10	<10	<10
	1.5-1.8		Flat	0.11	<10	<10	<10
1004	0.5-0.7	Bajool	Supratidal	0.11	<10	<10	63
	1.0-1.2		Flat	0.33	<10	135	200
	1.5-1.8			1.09	<10	599	690
1005	0.8-1.0	Bajool	Supratidal	<0.01	<10	<10	<10
	1.5-1.8		Flat	0.47	<10	204	287
1006	0.8-1.0	Bajool	Supratidal	<0.01	<10	<10	<10
	1.5-1.8		Flat	0.02	<10	<10	47
1007	0.8-1.0	Bajool	Supratidal	0.02	<10	<10	<10
	1.3-1.5		Flat	0.01	<10	<10	<10
1008	0.3-0.5	Port Alma	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	1.92	23	1402	1220
	1.5-1.8			1.37	<10	726	835
1009	0.3-0.5	Port Alma	Supratidal	<0.01	15	<10	18
	0.8-1.0		Flat	1.40	65	907	938
	1.5-1.8			1.83	41	1219	1180
1010	0.1-0.3	Port Alma	Supratidal	0.02	10	<10	22
	0.8-1.0		Flat	1.36	56	817	904
	1.5-1.8			1.34	<10	513	738
1011	0.4-0.5	Port Alma	Supratidal	0.01	<10	<10	18
	0.8-1.0		Flat	0.89	58	546	614
	1.5-1.8			1.30	40	727	857
1012	0.3-0.5	Port Alma	Supratidal	0.02	18	<10	30
	0.8-1.0		Flat	0.42	<10	166	276
	1.5-1.8			0.46	<10	38	207

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
1013	0.5-0.7	Bajool	Supratidal	1.87	43	1028	1230
	1.1-1.2		Flat	1.36	57	795	921
	1.5-1.8			1.88	65	1138	1270
1014	0.3-0.5	Bajool	Supratidal	0.05	<10	<10	26
	0.8-1.0		Flat	0.85	<10	355	495
	1.5-1.8			1.37	22	690	898
1015	1.8-2.0	Bajool	Extratidal	0.01	29	16	69
	2.8-3.0		Flat	0.64	<10	301	419
	3.6-3.9			0.60	<10	251	388
1016	0.3-0.5	Bajool	Supratidal	0.03	<10	<10	29
	0.8-1.0		Flat	1.10	42	618	744
	1.5-1.8			1.48	<10	750	958
1017	0.4-0.6	Bajool	Supratidal	0.04	<10	<10	11
	0.8-1.0		Flat	1.26	<10	352	648
	1.5-1.8			0.79	<10	163	382
1018	0.8-1.0	Port Alma	Plain	<0.01	<10	<10	<10
	1.8-2.0			<0.01	<10	<10	<10
	3.3-3.5			<0.01	<10	<10	<10
1019	0.8-1.0	Port Alma	Plain	0.01	<10	<10	17
	1.8-20			<0.01	24	12	111
	2.8-3.0			<0.01	33	16	92
	3.8-4.0			<0.01	<10	<10	<10
1020	0.6-0.8	Port Alma	Plain	<0.01	<10	<10	<10
	1.8-2.0			0.01	26	15	34
	2.8-3.0			<0.01	29	14	32
	3.8-4.0			0.03	<10	<10	<10
1021	0.8-1.0	Pelican	Drainage	0.03	<10	<10	10
	1.5-1.7	Creek	Depression	2.14	<10	1245	1340
	2.6-2.8			0.46	<10	12	184
1022	1.3-1.5	Port Alma	Plain	<0.01	<10	<10	<10
	2.0-2.3			<0.01	10	<10	13
1023	2.0-2.3	Port Alma	Supratidal	<0.01	22	12	25
	2.6-2.8		Flat	<0.01	28	14	37
1024	0.3-0.5	Port Alma	Supratidal	0.01	20	<10	28
	0.8-1.0		Flat	1.08	25	564	698
	1.6-1.8			1.27	13	665	807
1025	0.6-0.8	Inkerman	Supratidal	0.74	<10	350	470
	0.8-1.0	Creek	Flat	0.88	<10	432	560
	1.3-1.5			0.81	<10	340	515
	1.8-2.0			1.56	<10	707	909
	2.8-3.0			2.56	36	1448	1630
1026	0.5-0.7	Inkerman	Supratidal	0.02	<10	<10	21
	0.8-1.0	Creek	Flat	0.26	10	127	171
	1.4-1.6			0.09	<10	<10	29
1027	0.6-0.8	Inkerman	Supratidal	0.02	<10	<10	<10
	1.3-1.5	Creek	Flat	0.08	34	60	91
	1.8-2.0			0.89	41	361	469
	2.8-3.0			0.23	<10	109	152
1028	0.4-0.6	Port Alma	Supratidal	0.01	11	<10	20
	0.8-1.0		Flat	1.00	27	560	652
	1.5-1.8			1.07	14	551	681

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
1029	0.8-1.0	Bajool	Extratidal	<0.01	<10	<10	13
	1.8-2.0		Flat	<0.01	<10	<10	13
	2.3-2.5			<0.01	<10	<10	13
	2.8-3.0			0.31	37	164	228
	3.8-4.0			0.44	26	241	297
	4.3-4.5			0.14	<10	59	98
	4.6-4.8			<0.01	<10	<10	<10
1030	0.0-0.2	Port Alma	Drainage	0.07	24	36	69
	0.8-1.0		Depression	0.84	<10	410	535
	1.8-2.0			0.10	<10	<10	54
	2.8-3.0			0.98	<10	232	477
	3.8-4.0			0.46	<10	<10	<10
	4.6-4.8			0.91	<10	56	346
1031	0.8-1.0	Bajool	Embankment	<0.01	<10	<10	<10
	1.8-2.0			<0.01	<10	<10	<10
	2.8-3.0			<0.01	<10	<10	59
	3.8-4.0			<0.01	<10	<10	33
	4.8-5.0			0.01	<10	<10	16
	5.8-6.0			0.02	<10	<10	<10
	6.8-7.0			0.01	<10	<10	<10
	7.8-8.0			<0.01	<10	<10	<10
	8.8-9.0			0.01	<10	<10	<10
	9.8-10.0			<0.01	<10	<10	<10
	10.3-10.5			0.02	<10	<10	<10
1032	0.8-1.0	Bajool	Supratidal	<0.01	<10	<10	<10
	1.8-2.0		Flat	0.78	<10	145	364
	2.8-3.0			1.58	<10	938	992
	3.8-4.0			1.32	<10	698	799
	4.6-4.8			1.61	<10	444	807
	4.8-5.0			0.49	<10	122	250
	5.8-6.0			0.01	<10	<10	<10
1033	0.3-0.5	Bajool	Supratidal	<0.01	33	12	37
	0.8-1.0		Flat	0.70	13	341	450
	1.3-1.5			0.01	<10	<10	18
	1.8-2.0			1.00	<10	521	634
	2.8-3.0			1.41	9	507	760
1034	0.4-0.6	Bajool	Supratidal	0.68	<10	304	387
	0.8-1.0		Flat	3.57	110	2529	2330
	1.5-1.7			2.21	32	1346	1410
	1.8-2.0			1.71	26	1007	1090
	2.6-2.9			1.06	<10	498	627
1035	0.5-0.7	Casuarina	Intertidal	0.88	<10	368	499
	1.0-1.2	Creek	Flat	0.40	<10	98	207
	1.7-1.9			0.52	<10	120	283
	2.0-2.2			1.49	<10	673	872
	2.7-3.0			1.39	<10	523	758
1036	0.3-0.5	Raglan	Tidal Creek	<0.01	<10	<10	<10
	0.8-1.0	Creek		0.12	<10	17	68
	1.5-1.8			1.34	<10	663	849
1037	0.6-0.8	Port Alma	Supratidal	0.02	<10	<10	19
	0.9-1.1		Flat	0.73	11	381	466
	1.5-1.8			0.87	<10	333	481

Site No	Depth (m)	Locality	Landform	S_{POS} %	TAA mol H^+/t	TPA mol H^+/t	Net Acidity mol H^+/t
1038	0.6-0.8	Port Alma	Supratidal	0.02	10	<10	24
	1.0-1.2		Flat	0.44	20	210	295
	1.5-1.8			0.84	<10	345	480
1039	0.35-0.55	Port Alma	Supratidal	0.29	<10	114	193
	0.8-1.0		Flat	0.17	<10	<10	81
	1.5-1.8			0.78	<10	320	451
1040	0.3-0.5	Port Alma	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	0.95	<10	378	513
	1.5-1.8			0.55	<10	173	279
1041	0.3-0.5	Raglan	Supratidal	<0.01	<10	<10	<10
	0.6-0.8	Creek	Flat	0.15	<10	15	103
	1.6-1.8			1.16	18	525	633
1042	0.4-0.6	Raglan	Supratidal	0.15	<10	<10	49
	0.8-1.0	Creek	Flat	1.18	<10	459	678
	1.6-1.8			1.00	<10	500	633
1043	0.3-0.5	Raglan	Supratidal	0.04	<10	<10	34
	0.8-1.0	Creek	Flat	1.00	<10	519	635
	1.6-1.8			0.99	<10	411	569
1044	0.2-0.4	Raglan	Supratidal	<0.01	<10	<10	<10
	0.8-1.0	Creek	Flat	<0.01	13	<10	93
	1.6-1.8			<0.01	13	<10	36
1045	0.4-0.6	Raglan	Creek	<0.01	<10	<10	<10
	0.8-1.0	Creek	Bank	1.44	25	846	924
	1.6-1.8			1.22	<10	1004	710
1046	0.8-1.0	Bajool	Supratidal	<0.01	14	<10	18
	1.4-1.6		Flat	0.02	35	14	178
	2.0-2.3			0.87	34	512	578
1047	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.52	<10	214	334
	1.4-1.7			1.59	<10	809	1000
1048	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	0.47	14	225	309
	1.5-1.8			0.82	<10	356	464
1049	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	<0.01	12	<10	15
	1.8-2.0			0.03	<10	<10	10
1050	0.4-0.6	Bajool	Supratidal	<0.01	<10	<10	13
	0.8-1.0		Flat	<0.01	15	<10	18
	1.3-1.6			0.25	22	136	180
1051	0.3-0.5	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	0.01	<10	<10	<10
	1.6-1.8			0.02	<10	<10	<10
1052	0.4-0.6	Bajool	Supratidal	<0.01	<10	<10	<10
	0.8-1.0		Flat	<0.01	<10	<10	<10
	1.6-1.8			<0.01	<10	<10	<10
1053	0.6-0.8	Bajool	Plain	<0.01	<10	<10	<10
	1.7-1.9			0.02	<10	<10	<10
	2.8-3.0			0.77	<10	274	416
1054	0.8-1.0	Bajool	Plain	<0.01	18	<10	21
	1.8-2.0			<0.01	31	<10	34
	2.8-3.0			1.08	<10	378	600

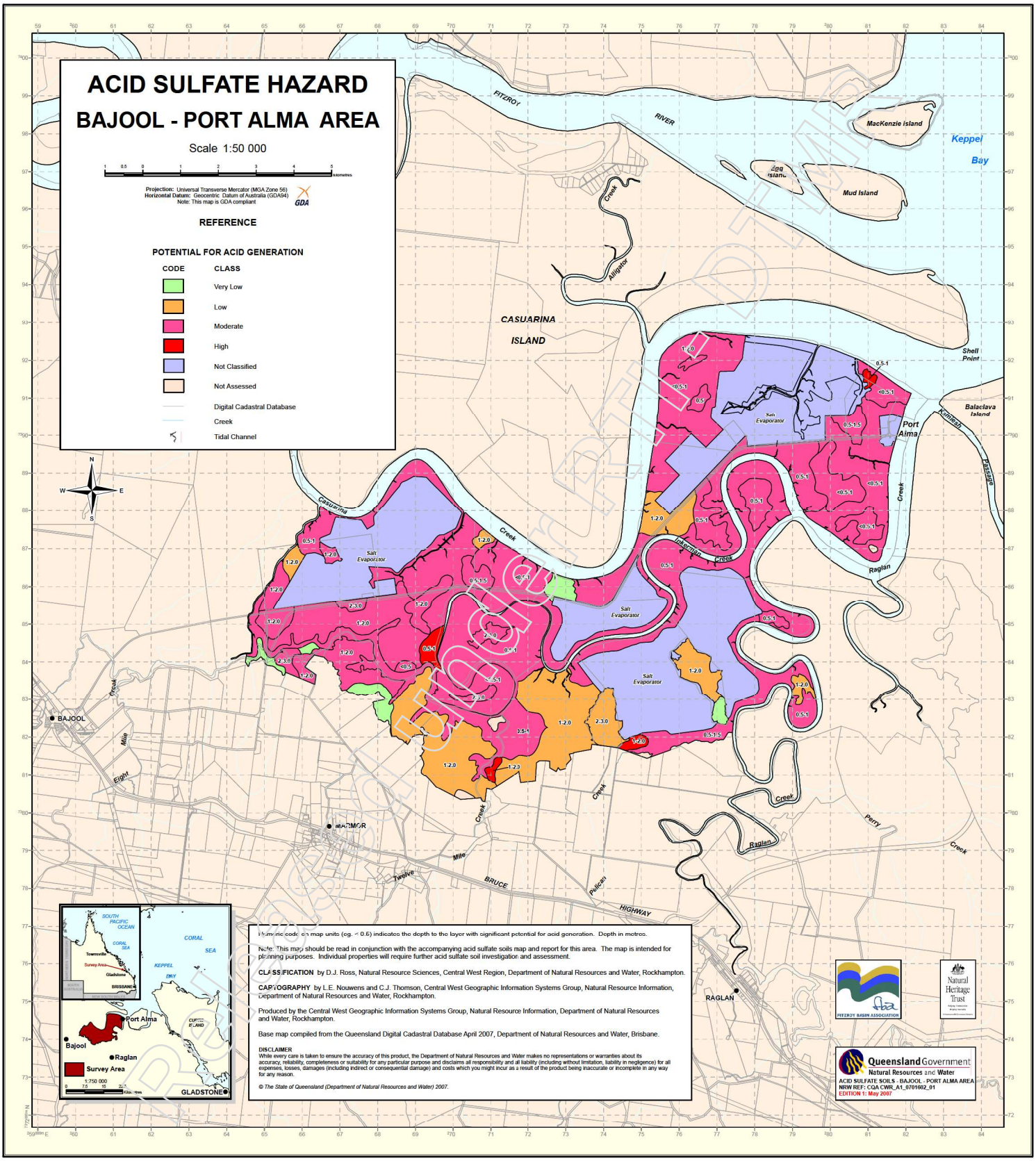
APPENDIX 2

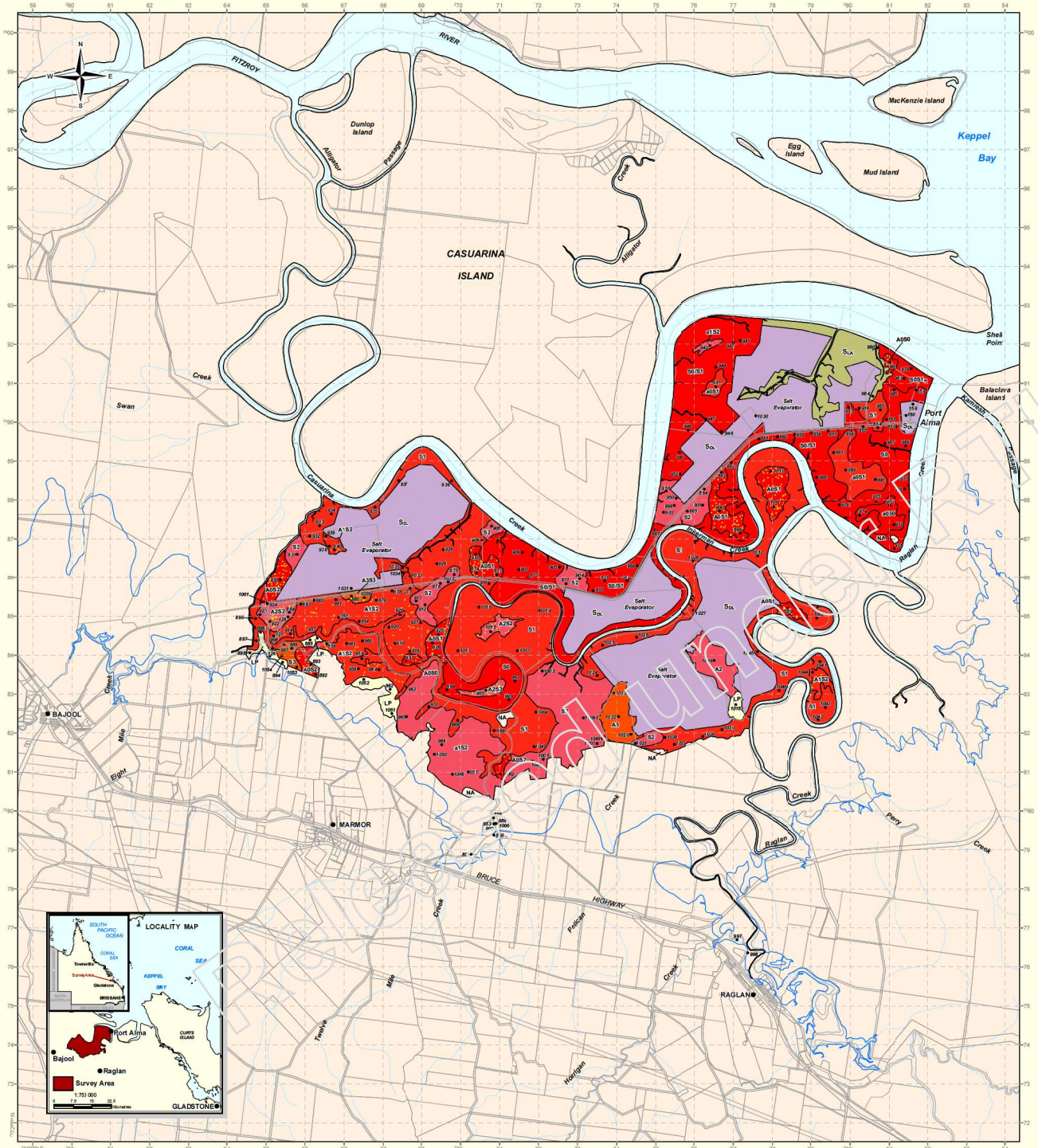
Retained acidity for selected samples with jarosite or field pH ≤ 5

Site No	Depth (m)	Texture[1] Category	Field pH[2]	S_{NAS}[3] (%)	s-S_{NAS}[4] (%)	a-S_{NAS}[5] (mol H^+/t)
CQA863	0.3-0.5	Fine	4.2	<0.005	0	0
CQA873	0.15-0.3	Fine	3.7	<0.005	0	0
CQA874	0.3-0.5	Fine	3.6	<0.005	0	0
CQA874	0.8-1.0	Fine	3.4	<0.005	0	0
CQA877	0.3-0.5	Fine	3.9	<0.005	0	0
CQA878	0.4-0.6	Fine	3.7	0.072	0.054	34
CQA878	0.8-1.0	Fine	3.8	0.005	0.004	2
CQA879	0.5-0.7	Fine	3.9	<0.005	0	0
CQA881	0.8-1.0	Fine	3.9	0.111	0.083	52
CQA881	1.6-1.8	Fine	3.6	0.058	0.044	27
CQA882	0.8-1.0	Fine	3.9	0.005	0.004	2
CQA884	1.3-1.5	Fine	3.8	0.027	0.020	13
CQA884	1.6-1.8	Fine	5.3	<0.005	0	0
CQA886	0.8-1.0	Fine	3.0	0.064	0.048	30
CQA889	2.2-2.4	Fine	4.0	<0.005	0	0
CQA892	0.4-0.6	Fine	4.0	0.791	0.593	370
CQA892	1.3-1.5	Medium	3.8	0.039	0.029	18
CQA893	0.4-0.6	Fine	3.9	0.015	0.011	7
CQA893	0.6-0.8	Fine	3.4	0.309	0.232	145
CQA899	0.2-0.3	Fine	5.0	0.147	0.110	69
CQA910	0.4-0.6	Fine	3.6	0.156	0.117	73
CQA914	0.65-0.8	Fine	3.9	0.006	0.005	3
CQA914	1.0-1.2	Fine	3.6	0.021	0.016	10
CQA917	0.4-0.6	Fine	3.3	0.007	0.005	3
CQA918	1.2-1.5	Fine	3.9	<0.005	0	0
CQA919	0.2-0.4	Fine	4.2	0.253	0.190	118
CQA919	0.5-0.7	Fine	3.3	<0.005	0	0
CQA920	0.8-1.0	Fine	3.0	0.006	0.005	3
CQA922	1.0-1.2	Fine	3.8	<0.005	0	0
CQA922	1.8-2.0	Fine	3.2	0.136	0.102	64
CQA923	2.7-2.9	Fine	4.1	<0.005	0	0
CQA924	0.8-1.0	Fine	4.1	0.044	0.033	21
CQA924	1.3-1.5	Fine	3.7	0.124	0.093	58
CQA924	1.8-2.0	Fine	3.9	<0.005	0	0
CQA925	0.8-1.0	Fine	2.5	0.128	0.096	60
CQA926	0.8-1.0	Fine	2.6	0.187	0.140	87
CQA930	0.4-0.6	Fine	3.2	0.522	0.392	244
CQA930	0.8-1.0	Fine	3.1	0.356	0.267	167
CQA938	0.8-1.0	Fine	3.7	<0.005	0	0
CQA938	1.6-1.9	Fine	3.3	0.038	0.029	18
CQA939	0.7-0.9	Fine	4.3	0.374	0.281	175
CQA939	1.6-1.8	Fine	3.5	0.007	0.005	3
CQA940	0.3-0.5	Fine	3.9	<0.005	0	0
CQA940	1.0-1.2	Fine	3.1	0.637	0.478	298
CQA940	1.5-1.8	Fine	2.9	0.596	0.447	279

Site No	Depth (m)	Texture[1] Category	Field pH[2]	S_{NAS}[3] (%)	s-S_{NAS}[4] (%)	a-S_{NAS}[5] (mol H^+/t)
CQA943	1.1-1.3	Fine	4.1	0.008	0.006	4
CQA945	0.2-0.4	Fine	4.5	0.005	0.004	2
CQA959	0.3-0.5	Fine	4.0	<0.005	0	0
CQA960	0.6-0.8	Fine	3.4	0.100	0.075	47
CQA960	1.0-1.2	Fine	3.2	0.080	0.060	37
CQA961	0.4-0.6	Fine	2.7	0.292	0.219	137
CQA961	0.8-1.0	Fine	2.5	0.126	0.024	59
CQA964	0.3-0.5	Fine	4.4	0.191	0.143	89
CQA970	0.6-0.8	Fine	3.3	<0.005	0	0
CQA972	0.3-0.5	Fine	4.4	0.194	0.146	90
CQA973	0.1-0.3	Fine	4.4	<0.005	0	0
CQA974	0.3-0.5	Fine	4.2	0.476	0.357	223
CQA981	0.2-0.4	Fine	3.6	0.020	0.015	9
CQA990	0.1-0.3	Fine	4.1	0.047	0.035	22
CQA991	0.2-0.4	Fine	4.6	<0.005	0	0
CQA995	1.5-1.7	Fine	3.9	0.305	0.229	143
CQA995	2.0-2.2	Fine	3.4	<0.005	0	0
CQA1000	2.3-2.6	Fine	4.0	<0.005	0	0
CQA1001	1.5-1.8	Fine	3.9	0.010	0.007	5
CQA1002	0.2-0.4	Fine	4.0	0.319	0.239	149
CQA1002	0.8-1.0	Fine	3.3	0.287	0.215	134
CQA1009	0.3-0.5	Fine	4.4	0.300	0.225	140
CQA1010	0.1-0.3	Fine	4.1	0.799	0.599	369
CQA1011	0.4-0.5	Fine	4.8	0.185	0.138	86
CQA1012	0.3-0.5	Fine	4.3	0.012	0.009	6
CQA1015	1.8-2.0	Fine	3.8	0.066	0.049	31
CQA1019	1.8-2.0	Fine	4.3	0.179	0.134	84
CQA1019	2.8-3.0	Fine	4.0	0.119	0.089	56
CQA1020	2.8-3.0	Fine	4.2	<0.005	0	0
CQA1023	2.0-2.3	Fine	3.9	0.033	0.025	15
CQA1023	2.6-2.8	Fine	4.1	0.012	0.009	6
CQA1024	0.3-0.5	Fine	3.6	0.024	0.018	11
CQA1027	1.3-1.5	Fine	3.7	0.014	0.010	5
CQA1031	2.8-3.0	Fine	3.0	0.099	0.074	46
CQA1031	3.8-4.0	Medium	3.5	0.043	0.032	20
CQA1033	0.3-0.5	Fine	3.4	<0.005	0	0
CQA1044	0.8-1.0	Fine	3.5	0.165	0.124	77
CQA1046	0.8-1.0	Fine	3.4	<0.005	0	0
CQA1046	1.4-1.6	Fine	3.1	0.291	0.218	136

[1] Ahern *et al.* (1998)
[2] Field pH before oxidation.
[3] Net acid soluble Sulfur (Ahern *et al.* 2004)
[4] Equivalent % pyrite Sulfur.
[5] Equivalent acidity units.





ACID SULFATE SOILS
BAJOOL - PORT ALMA AREA

Scale 1:50 000

1 0.5 0 1 2 3 4 5 kilometres

Projection: Universal Transverse Mercator (MGA Zone 56)
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Note: This map is GDA compliant

GDA

REFERENCE

ACID SULFATE SOILS (ASS)[1] ON RELATIVELY UNDISTURBED LAND

Depth	Depth Code	Depth to Actual Acid Sulfate Soil[2] (pH ≤4.0)	Depth to Strongly Acidic Soil Layer[3] (pH >4.0 to ≤5.0)	Depth to Potential Acid Sulfate Soil[3]
0 - 0.5m	0	A0	a0	S0
0.5 - 1m	1	A1	a1	S1
1 - 2m	2	A2	a2	S2
2 - 3m	3	A3	a3	S3
3 - 4m	4	A4	a4	S4
4 - 5m	5	A5	a5	S5
>5m	5+	A5+	a5+	S5+

NOTE:
- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
- Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs e.g. A0S2 the map unit is coloured according to the depth of the upper surface of the 'actual' layer (A0) and overlayed with yellow dots. An 'a' preceding the soil depth code indicates a strong acid soil layer with field pH ranging from > 4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation. While 'a' depth code is shown on the map, no colour is assigned to it.
- In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, a forward slash is used e.g. S1/S2. The areas are coloured according to the shallowest depth of the occurence.
- Subscript N indicates areas with oxidisable sulfur values that exceed the action criteria[4] but contain varying amounts of carbonate materials that may compensate for the potential acidity. Commonly the carbonate materials are naturally occurring shell fragments, coral fragments or Foraminifera. Depth codes are as above e.g. a potential acid sulfate soil (rich in carbonate) occuring at 1 to 2m depth is designated $S2_N$.

S_{LA} Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance eg. National Parks, Reserves etc., or land where accessibility is severely restricted.

ACID SULFATE ON DISTURBED LAND

S_{DL} Disturbed land, e.g. Saltworks, Reclaimed Land, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS (In some cases partial or full treatment may have been undertaken). Limited field investigation.

LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE

LP Land predominatly below 5m AHD[5] with low probability of ASS occurrence. Limited field investigation.

LAND NOT ASSESSED

NA Land not assessed for sulfidic materials as part of this survey.

5m AHD Contour
Digital Cadastral Database
Tidal Channel
1052 Sample Site CQA 1052

[1] **Acid sulfate soil** is the generic term used to define soils derived from estuarine sediments containing iron sulfides (pyrite) or containing the acidic products of the oxidation of sulfides. The term includes actual and potential acid sulfate soils. Unless used with the superscript P, the code 'S' implies sulfidic sediments of Holocene age. The superscript P implies sediments of Pleistocene age[6].

[2] An "A" preceding the soil depth code indicates the probable depth to an **Actual Acid Sulfate Soil (AASS)**[7] layer or horizon which has mobile acidity in the form of ionic hydrogen, aluminium, iron or acid salts. AASS are soils where yellow jarosite mottles occur and/or a field pH of ≤ 4.0exists and/or the existing acidity exceeds the "Action Criteria"[4]. Extensive areas with high actual acidity derived from sulfide oxidation may constitute significant environmental hazard. An "a" preceding the depth code indicates the probable depth to a soil layer or horizon with field pH ranging from >4.0 to ≤ 5.0. This may or may not be a result of sulfide oxidation as some soils with high organic mater may have low pH from organic acids. Further analysis for existing acidity is usually required to determine if the "Action Criteria" is exceeded.

[3] An "S" preceding the soil depth code indicates the probable depth to a **Potential AcidSulfate Soil (PASS)**[7] layer or horizon. PASS are soils where the oxidisable sulfur percentage or titratable sulfidic acidity or net acidity exceeds the prescribed "Action Criteria" in note 4. Testing for oxidisable sulfur is conducted by the Chromium Reducible Sulfur (S_{Cr}) method or the Suspension Peroxide Oxidation Combined Acidity and Sulfur (SPOCAS) method.

[4] Net acidity or oxidisable sulfur "Action Criteria" that trigger treatment are currently: Sands, 18 mol H+/t (0.03 %S); Loams to light days, 36 mol H+/t (0.06 %S; Medium to heavy days, 62 mol H+/t (0.1 %S). When deciding whether treatment is required net acidity should be calculated as defined in the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al 2004) and compared to the Action Criteria above. NOTE: for disturbances > 1000 tonnes, the action criteria is 18 mol H+/t (0.03 %S) regardless of soil texture.

[5] The reliability of elevation data is variable across the study area. AHD refers to Australian Height Datum.

[6] The primary focus of ASS investigation in this study are the sulfidic sediments that were deposited in the Holocene epoch, that is, during the last 10 000 years. Experience in coastal stratigraphic mapping shows that similar, but much older sulfidic sediments of Pleistocene age can occur, still in a reduced (anaerobic) state, being buried under either cemented sands or oil, consolidated alluvium. They are far less common than the Holocene equivalents, and have been found beneath land whose surface is both above and below 5m AHD. Generally, Pleistocene sediments will be found at greater depths below the surface than equivalent Holocene sediments.

[7] The distinction between AASS and PASS is rarely clear and that it is not uncommon for a soil layer or horizon to contain both AASS and PASS. Likewise the severity of AASS or PASS can vary in their distribution vertically or spatially. Mapping codes reflect the dominant category based on this sampling. In most cases detailed sampling and analysis is usually required under the State Planning Policy 2/02 "Planning and Managing Development Involving Acid Sulfate Soils".

NOTE: This map should be read in conjunction with the accompanying report for this area.

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LABORATORY ANALYSIS by Natural Resource Sciences Laboratories, Department of Natural Resources and Water, Indooroopilly Sciences Centre, Brisbane.

Produced by the Central West Geographic Information Systems Group, Natural Resource Information, Department of Natural Resources and Water, Rockhampton.

Base map compiled from the Queensland Digital Cadastral Database April 2007, Department of Natural Resources and Water, Brisbane.

FITZROY BASIN ASSOCIATION

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Queensland Government
Natural Resources and Water

ACID SULFATE SOILS - BAJOOL - PORT ALMA AREA
NRW REF: CQA CWR_A0_07t1601_01
EDITION 1: JUNE 2007

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Design Traffic Calculations - 2012 Austroads Method

Traffic Load Distribution: Austroads 2012 Table F.1 Example traffic load distribution

Damage Index	Value
N_{HVAG}	2.5
ESA/HVAG	0.70

SAR5/ESA	1.1
SAR7/ESA	1.6
SAR12/ESA	12.0

ESA/HV	1.75

Summary of Results

	5 years	20 years	30 years	40 years
N_{DT}	2.40E+05	1.21E+06	2.15E+06	3.41E+06
DESA	**1.68E+05**	**8.50E+05**	1.50E+06	2.38E+06
DSAR5	1.86E+05	9.41E+05	1.67E+06	2.64E+06
DSAR7	2.69E+05	1.36E+06	2.41E+06	3.81E+06
DSAR12	2.01E+06	1.02E+07	1.80E+07	2.86E+07
Daily ESA in design lane at opening				87

Design Year	Design Period (from start of year to start of year)		Annual Average Daily Traffic or vpd (at start of year)	Direction Factor	Percent HV	Lane Distribution Factor	Design Period (years)	Annual Growth Rate of HV (%)	Cumulative Growth Factor	HVAG per year	Design number of Equivalent Standard Axles	Standard Axle Repetitions		
	From	To	AADT	DF	%HV	LDF	P	R	CGF	N_{DT}	DESA	DSAR5	DSAR7	DSAR12
before opening	2017	2017	259	0.50	38.2	1.00	0	3.0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1	2017	2018	259	0.50	38.2	1.00	1	3.0	1.00	4.52E+04	3.13E+04	3.50E+04	5.06E+04	3.79E+05
2	2018	2019	267	0.50	38.2	1.00	1	3.0	1.00	4.65E+04	3.26E+04	3.61E+04	5.21E+04	3.91E+05
3	2019	2020	275	0.50	38.2	1.00	1	3.0	1.00	4.79E+04	3.35E+04	3.71E+04	5.37E+04	4.02E+05
4	2020	2021	283	0.50	38.2	1.00	1	3.0	1.00	4.94E+04	3.45E+04	3.83E+04	5.53E+04	4.15E+05
5	2021	2022	292	0.50	38.2	1.00	1	3.0	1.00	5.08E+04	3.56E+04	3.94E+04	5.69E+04	4.27E+05
6	2022	2023	300	0.50	38.2	1.00	1	3.0	1.00	5.24E+04	3.67E+04	4.06E+04	5.86E+04	4.40E+05
7	2023	2024	309	0.50	38.2	1.00	1	3.0	1.00	5.39E+04	3.77E+04	4.18E+04	6.04E+04	4.53E+05
8	2024	2025	319	0.50	38.2	1.00	1	3.0	1.00	5.55E+04	3.89E+04	4.31E+04	6.22E+04	4.67E+05
9	2025	2026	328	0.50	38.2	1.00	1	3.0	1.00	5.72E+04	4.00E+04	4.44E+04	6.41E+04	4.81E+05
10	2026	2027	338	0.50	38.2	1.00	1	3.0	1.00	5.89E+04	4.13E+04	4.57E+04	6.60E+04	4.95E+05
11	2027	2028	348	0.50	38.2	1.00	1	3.0	1.00	6.07E+04	4.25E+04	4.71E+04	6.80E+04	5.10E+05
12	2028	2029	359	0.50	38.2	1.00	1	3.0	1.00	6.25E+04	4.38E+04	4.85E+04	7.00E+04	5.25E+05
13	2029	2030	369	0.50	38.2	1.00	1	3.0	1.00	6.44E+04	4.51E+04	4.99E+04	7.21E+04	5.41E+05
14	2030	2031	380	0.50	38.2	1.00	1	3.0	1.00	6.63E+04	4.64E+04	5.14E+04	7.43E+04	5.57E+05
15	2031	2032	392	0.50	38.2	1.00	1	3.0	1.00	6.83E+04	4.78E+04	5.30E+04	7.65E+04	5.74E+05
16	2032	2033	404	0.50	38.2	1.00	1	3.0	1.00	7.04E+04	4.93E+04	5.46E+04	7.88E+04	5.91E+05
17	2033	2034	416	0.50	38.2	1.00	1	3.0	1.00	7.25E+04	5.07E+04	5.62E+04	8.12E+04	6.09E+05
18	2034	2035	428	0.50	38.2	1.00	1	3.0	1.00	7.46E+04	5.23E+04	5.79E+04	8.36E+04	6.27E+05
19	2035	2036	441	0.50	38.2	1.00	1	3.0	1.00	7.69E+04	5.38E+04	5.96E+04	8.61E+04	6.46E+05
20	2036	2037	454	0.50	38.2	1.00	1	3.0	1.00	7.92E+04	5.54E+04	6.14E+04	8.87E+04	6.65E+05
21	2037	2038	468	0.50	38.2	1.00	1	3.0	1.00	8.16E+04	5.71E+04	6.32E+04	9.14E+04	6.85E+05
22	2038	2039	482	0.50	38.2	1.00	1	3.0	1.00	8.40E+04	5.88E+04	6.51E+04	9.41E+04	7.06E+05
23	2039	2040	496	0.50	38.2	1.00	1	3.0	1.00	8.65E+04	6.06E+04	6.71E+04	9.69E+04	7.27E+05
24	2040	2041	511	0.50	38.2	1.00	1	3.0	1.00	8.91E+04	6.24E+04	6.91E+04	9.98E+04	7.49E+05
25	2041	2042	526	0.50	38.2	1.00	1	3.0	1.00	9.18E+04	6.43E+04	7.12E+04	1.03E+05	7.71E+05
26	2042	2043	542	0.50	38.2	1.00	1	3.0	1.00	9.46E+04	6.62E+04	7.33E+04	1.06E+05	7.94E+05
27	2043	2044	559	0.50	38.2	1.00	1	3.0	1.00	9.74E+04	6.82E+04	7.55E+04	1.09E+05	8.18E+05
28	2044	2045	575	0.50	38.2	1.00	1	3.0	1.00	1.00E+05	7.02E+04	7.78E+04	1.12E+05	8.43E+05
29	2045	2046	593	0.50	38.2	1.00	1	3.0	1.00	1.03E+05	7.23E+04	8.01E+04	1.16E+05	8.68E+05
30	2046	2047	610	0.50	38.2	1.00	1	3.0	1.00	1.06E+05	7.45E+04	8.25E+04	1.19E+05	8.94E+05
31	2047	2048	629	0.50	38.2	1.00	1	3.0	1.00	1.10E+05	7.67E+04	8.50E+04	1.23E+05	9.21E+05
32	2048	2049	648	0.50	38.2	1.00	1	3.0	1.00	1.13E+05	7.90E+04	8.75E+04	1.26E+05	9.48E+05
33	2049	2050	667	0.50	38.2	1.00	1	3.0	1.00	1.16E+05	8.14E+04	9.02E+04	1.30E+05	9.77E+05
34	2050	2051	687	0.50	38.2	1.00	1	3.0	1.00	1.20E+05	8.39E+04	9.29E+04	1.34E+05	1.01E+06
35	2051	2052	708	0.50	38.2	1.00	1	3.0	1.00	1.23E+05	8.64E+04	9.57E+04	1.38E+05	1.04E+06
36	2052	2053	729	0.50	38.2	1.00	1	3.0	1.00	1.27E+05	8.90E+04	9.85E+04	1.42E+05	1.07E+06
37	2053	2054	751	0.50	38.2	1.00	1	3.0	1.00	1.31E+05	9.16E+04	1.01E+05	1.47E+05	1.10E+06
38	2054	2055	773	0.50	38.2	1.00	1	3.0	1.00	1.35E+05	9.44E+04	1.05E+05	1.51E+05	1.13E+06
39	2055	2056	796	0.50	38.2	1.00	1	3.0	1.00	1.39E+05	9.72E+04	1.08E+05	1.56E+05	1.17E+06
40	2056	2057	820	0.50	38.2	1.00	1	3.0	1.00	1.43E+05	1.00E+05	1.11E+05	1.60E+05	1.20E+06
									Total	**3.41E+06**	**2.38E+06**	**2.64E+06**	**3.81E+06**	**2.86E+07**

5 YEAR DESIGN LOADINGS OPTIONS:

CIRCLY Pro - Version 6.0 (30 January 2015)

Job Title: Bajool Port Alma Road

Damage Factor Calculation

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

Load No.	Load ID	Movements
1	ESA750-Full	1.00E+00

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: BPA_01 Title: **Pavement Design - Granular Pavement - Option 1 - 5 Years**

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_240	Aniso.	2.40E+02	0.35	1.78E+02	1.20E+02	0.35
3	rough	Gran_120	Aniso.	1.20E+02	0.35	8.89E+01	6.00E+01	0.35
4	rough	Sub_CBR3	Aniso.	3.00E+01	0.45	2.07E+01	1.50E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
4	top	Sub_CBR3	EZZ	0.009300	7.000	1.600

Reliability Factors:
Project Reliability: Austroads 90%

Layer No.	Reliability Factor	Material Type
4	1.00	Subgrade (Austroads 2004)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering
Layer no. 3: Austroads (2004) sublayering

Results:

Layer No.	Thickness	Material ID	Load ID		Critical Strain	CDF
1	150.00	Gran_350		n/a		n/a
2	150.00	Gran_240		n/a		n/a
3	175.00	Gran_120		n/a		n/a
4	0.00	Sub_CBR3	ESA750-Full		1.49E-03	4.42E-06

CIRCLY Pro - Version 6.0 (30 January 2015)

Layer no. 3 is INCLUDED in max. CDF calculation
Job Title: Bajool Port Alma Road

Damage Factor Calculation

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

Load No.	Load ID	Movements
1	ESA750-Full	1.68E+05

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: BPA_01 Title: **Pavement Design - CH 4.72 to Ch 19.7**

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_240	Aniso.	2.40E+02	0.35	1.78E+02	1.20E+02	0.35
3	rough	Sub_CBR3	Aniso.	3.00E+01	0.45	2.07E+01	1.50E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
3	top	Sub_CBR3	EZZ	0.009300	7.000	1.600

Reliability Factors:
Project Reliability: Austroads 90%

Layer No.	Reliability Factor	Material Type
3	1.00	Subgrade (Austroads 2004)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Automatic layer thickness design:
Layer number to be designed: 2
Minimum thickness: 0
Maximum thickness: 5000

Results:

Layer No.	Thickness	Material ID	Load ID	Critical Strain	CDF
1	200.00	Gran_350	n/a		n/a
2	261.57	Gran_240	n/a		n/a
3	0.00	Sub_CBR3	ESA750-Full	1.56E-03	9.93E-01

20 YEAR DESIGN LOADINGS OPTIONS:

CIRCLY Pro - Version 6.0 (30 January 2015)

Layer no. 4 is INCLUDED in max. CDF calculation
Job Title: Bajool

Damage Factor Calculation

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

Load No.	Load ID	Movements
1	ESA750-Full	8.50E+05

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: Bajool-Port Alma Title: Granular Pavement option -Option 1

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_210	Aniso.	2.10E+02	0.35	1.56E+02	1.05E+02	0.35
3	rough	Gran_120	Aniso.	1.20E+02	0.35	8.89E+01	6.00E+01	0.35
4	rough	Sub_CBR3	Aniso.	3.00E+01	0.45	2.07E+01	1.50E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
4	top	Sub_CBR3	EZZ	0.009300	7.000	1.600

Reliability Factors:
Project Reliability: Austroads 90%

Layer No.	Reliability Factor	Material Type
4	1.00	Subgrade (Austroads 2004)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering
Layer no. 3: Austroads (2004) sublayering

Automatic layer thickness design:
Layer number to be designed: 3
Minimum thickness: 0
Maximum thickness: 5000

Results:

Layer No.	Thickness	Material ID	Load ID		Critical Strain	CDF
1	150.00	Gran_350		n/a		n/a
2	150.00	Gran_210		n/a		n/a
3	229.53	Gran_120		n/a		n/a
4	0.00	Sub_CBR3	ESA750-Full		1.24E-03	9.99E-01

CIRCLY Pro - Version 6.0 (30 January 2015)

Layer no. 3 is INCLUDED in max. CDF calculation
Job Title: Bajool

Damage Factor Calculation

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

Load No.	Load ID	Movements
1	ESA750-Full	8.50E+05

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: Bajool-Port Alma Title: Cement Modified Pavement option - Option 2

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran 350	Aniso.	3.50E+02	0.35	2.59E+02	1.75E+02	0.35
2	rough	Gran_150	Aniso.	1.50E+02	0.35	1.11E+02	7.50E+01	0.35
3	rough	Sub_CBR3	Aniso.	3.00E+01	0.45	2.07E+01	1.50E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
3	top	Sub_CBR3	EZZ	0.009300	7.000	1.600

Reliability Factors:
Project Reliability: Austroads 90%

Layer No.	Reliability Factor	Material Type
3	1.00	Subgrade (Austroads 2004)

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Automatic layer thickness design:
Layer number to be designed: 2
Minimum thickness: 0
Maximum thickness: 5000

Results:

Layer No.	Thickness	Material ID	Load ID	Critical Strain	CDF
1	200.00	Gran_350	n/a		n/a
2	334.07	Gran_150	n/a		n/a
3	0.00	Sub_CBR3	ESA750-Full	1.24E-03	1.00E+00

CIRCLY Pro - Version 6.0 (30 January 2015)

Job Title: Bajool

Damage Factor Calculation

Assumed number of damage pulses per movement:
Combined pulse for gear (i.e. ignore NROWS)

Traffic Spectrum Details:

Load No.	Load ID	Movements
1	ESA750-Full	1.00E+00

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA750-Full	ESA750-Full	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA750-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA750-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA750-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA750-Full	1	1965.0	0.0	1.00E+00	0.00

Layout of result points on horizontal plane:
Xmin: 0 Xmax: 165 Xdel: 165
Y: 0

Details of Layered System:

ID: Bajool-Port Alma Title: Foam Bitumen Pavement options - Option 3

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Asph1800	Iso.	1.80E+03	0.40			
2	rough	Gran 100	Aniso.	1.00E+02	0.35	7.41E+01	5.00E+01	0.35
3	rough	Sub_CBR3	Aniso.	3.00E+01	0.45	2.07E+01	1.50E+01	0.45

Performance Relationships:

Layer No.	Location	Material ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
1	bottom	Asph1800	ETH	0.003293	5.000	1.100
3	top	Sub_CBR3	EZZ	0.009300	7.000	1.600

Reliability Factors:
Project Reliability: Austroads 90%

Layer No.	Reliability Factor	Material Type
1	1.50	Asphalt
3	1.00	Subgrade (Austroads 2004)

Details of Layers to be sublayered:
Layer no. 2: Austroads (2004) sublayering

Results:

Layer No.	Thickness	Material ID	Load ID		Critical Strain	CDF
1	300.00	Asph1800	ESA750-Full		-1.87E-04	4.34E-07 PL = 2.3E06
2	155.00	Gran 100		n/a		n/a
3	0.00	Sub_CBR3	ESA750-Full		4.53E-04	1.05E-09