MUDGEE STONE COMPANY PTY LTD

ABN: 89 100 974 365

Oberon White Granite Quarry

Traffic Assessment

Prepared by

Barnson Pty Limited

ABN 43 088 342 625

Specialist Consultant Studies Compendium

Part 7

August 2010

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Oberon White Granite Quarry

Traffic Assessment

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1 INTRODUCTION

Barnson Pty Limited has been commissioned by RW Corkery & Co Pty Ltd on behalf of Mudgee Stone Company Pty Ltd to prepare an intersection assessment and road capability assessment for the proposed quarry operations at the Oberon White Granite Quarry, Lot 2 DP1089826 Ferndale Road, Oberon.

The relevant government legislation that determines policy for traffic generating developments and that have been considered within this assessment includes:

(a) State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007; and
(b) *Roads Act 1993*.

In addition to the identified legislation, guidelines that have been considered for this assessment include the Roads and Traffic Authority's (RTA) document "NSW Road Design Guide", Guide to Traffic Generating Development and relevant Austroads standards.

2 EXISTING SITE CONDITIONS

2.1 PROJECT SITE LOCATION AND ACCESS

The Project Site coincides with the boundaries of Lot 2 DP1089826 Ferndale Road, Oberon. Access to Ferndale Road is via Hampton Road (MR558), approximately 6km east-southeast of Oberon. A locality sketch is provided within **Appendix A**.

2.2 EXISTING TRAFFIC CONDITIONS

Hampton Road is a sealed dual carriageway RTA controlled road, with sealed shoulders, centreline and shoulder line markings and a legal speed limit of 100km/hr. Hampton Road generally consists of one lane in each direction, although, a second slow vehicle lane commences on the east bound lane adjacent to the Ferndale Road intersection. Oblique aerial photographs of the intersection are provided in **Appendix B**.

Ferndale Road has a legal speed limit of 60km/hr and is a Council controlled road providing access to the existing quarry and local properties. Ferndale Road, upgraded by the Proponent in accordance with their current approval DA 126/03, consists of an 8m wide compacted 130mm/170mm base / sub base with a 6m wide two-coat bitumen seal. At the intersection with Hampton Road, Ferndale Road, the carriageway consist of a 40mm asphaltic concrete seal extending for approximately 50m and providing a 15m wide turning radius.

At the intersection, site distances to the east and west along Hampton Road are approximately 245m and 230m respectively.

2.3 AMBIENT TRAFFIC FLOWS

The latest available traffic recorded by the RTA shows the annual average daily traffic (AADT) for Hampton Road during 2007 was approximately 1,200 (Fish River Bridge station to the east of the Hampton / Ferndale Road intersection) of which approximately 19% (228) were heavy vehicles. No traffic count information is available for Ferndale Road, however, considering that the road provides access to a limited number of landholdings and does not provide thoroughfare, the existing traffic volumes would be very low.

Since the latest traffic figure counts for Hampton Road in 2007, the Oberon Local Government Area has experienced above average growth (* Source: Mr Ian Tucker, Oberon Council 31/05/2010). For the purposes of this report, a current AADT of 1,290 vehicles per day has been assumed. This is has been based on an ongoing growth rate of 2.5% which is conservatively higher than the recorded of 2.1% up to 2005.

Table 2.1 provides a summary of the projected traffic levels on Hampton Road over the next 30 years assuming the absence of additional traffic from the proposed operations.

Table 2.1
Predicted AADT – Hampton Road

Year	Total Vehicles	Light Vehicles per day	Heavy Vehicles per day*
2010	1290	1045	245
2015	1460	1182	277
2020	1651	1338	314
2025	1868	1513	355
2030	2114	1712	402
2035	2392	1937	454
2040	2706	2192	514

*Based on 19% of total vehicles classed as heavy vehicles.

Based on current traffic levels, Hampton Road would experience a peak hourly traffic flow of approximately 130 vehicles per hour. It is assumed that there is an equal number of traffic movements in each direction (ie. 65 vehicles per hour in each direction). By 2040, peak hourly traffic flow is predicted to increase to approximately 270 vehicles per hour or 135 vehicles per hour in each direction.

2.4 ACCIDENT HISTORY

In the five year period 2005 to 2010, there have not been any recorded crashes involving vehicles utilising the intersection of Ferndale and Hampton Roads (RTA 2010). It is noted that one fatal accident was recorded immediately to the west of the intersection in 2009. The accident involved a west bound light vehicle which lost control on loose gravel on the road shoulder before veering across double lines into eastbound traffic. Speed was recorded as a contributing factor.

2.5 PUBLIC TRANSPORT

Hampton Road is known to be a local school bus route. Discussions with the local bus company operator indicate that a single school bus operates with school children picked up / dropped off at several stops on Hampton Road east of Ferndale Road, the closest approximately 4km distant. It is advised that there are no bus stops on Ferndale Road or on Hampton Road west of Ferndale Road.

2.6 PEDESTRIAN NETWORK

At present, Hampton and Ferndale Roads have no paved pedestrian access.

2.7 OTHER PROPOSED DEVELOPMENTS

At present, no other significant developments are known to be planned within the vicinity of the Project Site or that would result in significant traffic generation on Hampton or Ferndale Roads. * Source: Ms Janet Bailey, Oberon Council 31/05/2010.

3 PROPOSED DEVELOPMENT

3.1 THE DEVELOPMENT

Mudgee Stone Company Pty Ltd proposes to extend its existing extraction and processing operations and increase production at the Oberon White Granite Quarry. Production would be increased to a maximum of 250 000 tonnes per year averaging approximately 200 000 tonnes per year over approximately 30 years. Product trucks transporting material from the quarry would typically range from 2 axle rigid trucks, truck and dog trailers and 6 axle semi-trailers.

3.2 ACCESS

The development would continue to be accessed by the existing Hampton Road/Ferndale Road intersection.

With reference to table 4.7 of the NSW Road Design Guide, the recommended approach sight distances and safe intersection sight distance for a 100km/hr zone are 150m and 225m respectively. With reference to table 6.3 of AUSTROADS 2005 “Guide to Engineering Practice - Part 5: Intersections at Grade” the recommended approach sight distances and safe intersection sight distance for a 100km/hr zone are 157m and 240m respectively.

The approach site distance to the intersection is approximately 200m, which exceeds the RTA and AUSTROADS requirements. The available sight intersection distance is a minimum of 240m, which also exceeds the RTA requirements.

4 IMPACTS OF THE PROPOSED DEVELOPMENT

4.1 TRAFFIC GENERATION

Traffic generation figures have been outlined by Mudgee Stone Company Pty Ltd within the *Environmental Assessment* for the Project. In summary, the proposed daily project-related traffic levels are as follows.

- Sales and dispatch – average: 27 loads resulting in 54 heavy vehicle movements per day (vpd).
  - 85th percentile: 34 loads resulting in 68 heavy vpd.
- Delivery vehicles – 2 heavy vpd.
- Employee – 20 light vpd.

For the purposes of analysis, the following peak hourly traffic levels have been assumed.

- Sales and dispatch – 12 heavy vehicle movements per hour (vph).
- Delivery vehicles – 2 heavy vph.
- Employee – 10 light vph.

It is noted that employee traffic movements have been assumed to all occur within a single hour during the morning peak and afternoon peak times.

The additional traffic generation caused by the development is summarised in **Table 4.1**.

Table 4.1
Traffic Generation – Hampton Road

	AVERAGE ANNUAL DAILY TRAFFIC (AADT)	VEHICULAR TRIPS per PEAK HOUR (vph)
EXISTING	1290 vpd	130 vph
PROJECT-RELATED	90 vpd	24 vph

4.2 TRAFFIC DISTRIBUTIONS AND ASSIGNMENTS

For Hampton Road, it is estimated that the Project would resulting in an increase of approximately 24 vehicle movements, of which 14 would relate to heavy vehicles, per hour during the peak times 6:00am to 8:00am and 2:00pm to 4:00pm.

Mudgee Stone Company Pty Ltd approximate that 20% of product truck movements would enter and exit the intersection from or towards Oberon (westwards of the Project Site), with the remaining 80% towards Sydney (eastwards of the Project Site). However, for impact assessment purposes, to assess the potential worst case scenario, it has been assumed that 100% of vehicles would enter and exit from or towards Sydney (eastwards of the Project Site).

Therefore, the additional traffic generation caused by the development is summarised in **Table 4.2.**

Table 4.2
Traffic Distribution – Hampton Road

	AVERAGE ANNUAL DAILY TRAFFIC (AADT)	VEHICULAR TRIPS per PEAK HOUR (vph)
EXISTING	1250 vpd	125 vph
Additional Vehicles turning from/to east	90 vpd	24vph
TOTAL	**1340 vpd**	**149 vph**
VEHICLES PER LANE	**670 vpd**	**75 vph**

4.3 IMPACT ON TRAFFIC SAFETY

With reference to figure B.3(c) of AUSTROADS 2005 "Guide to Engineering Practice - Part 5: Intersections at Grade", and with a critical acceptance gap of five (5) seconds and a follow-up headway of three (3) seconds, the major flow on Hampton Road will have a Practical Absorption capacity in excess of 800 cars per hour. As only an additional 24 vehicles would be entering and leaving the site to/from the east, there would continue to be a large number of gaps in the traffic flow to accept the additional generated traffic.

As such, under the Gap Acceptance Theory, the effects to traffic generation will be minimal. The Average Delay per Vehicle will be less than 14 seconds, with the Hampton Road functioning at a Level of Service "A" [1]

If we assumed 2.5% growth over the life of the quarry, the major flow on Hampton Rd will be 312vph in 2040. Using the same methodology above, Hampton Road will have a Practical Absorption capacity in excess of 500 cars per hour and continue to function at a Level of Service "A".

The intersection therefore complies with the relevant RTA and AUSROADS standards.

4.4 PUBLIC TRANSPORT

With the use of a truck drivers code of conduct whereby drivers are informed about the school bus route, stops and times, it is considered that the Project would not significantly impact upon public transport.

4.5 PEDESTRIAN NETWORK

As there is no existing pedestrian infrastructure, with the implementation of standard safe driving practices, it is considered that the Project would not significantly impact upon the pedestrian network.

[1] Level of Service is a qualitative measure describing operational conditions within a traffic stream and takes into account service measures such as speed and travel time, freedom to manoeuvre, traffic interruptions, safety, comfort and convenience. There are six levels of service, designated A (best – free flow) to F (worst – breakdown in flow) (Austroads, 2005).

4.6 RECOMMENDED WORKS

In addition to the Truck Drivers Code of conduct outlined within the *Environmental Assessment* for the Project, the following works are also recommended.

- Install a give way line on the Ferndale Road approach to Hampton Road. This line should be setback 7.5m from the existing road centreline, as shown in **Appendix C**.
- Install a give way sign on the Ferndale Road approach to Hampton Road.
- Install reflective marker posts on the approach lane of Hampton Road 240m east and 240m west of the Ferndale Road intersection for the assessment of visibility during poor weather conditions (eg. fog).
- Install 'Fog Signs' in consultation with the RTA, 240m east and 240m west of the proposed intersections. If these signs are not able to be sighted prior to vehicles exiting the site, operations should be suspended.

5 PAVEMENT ANALYSIS – FERNDALE ROAD

5.1 CURRENT PAVEMENT DESIGN

Ferndale Road was constructed by Mudgee Stone Company Pty Ltd prior to being dedicated as a public road in accordance with the pavement design completed by Macquarie Geotech. The principal characteristics of the pavement design are as follows.

- An 8 metre wide compacted Base & Sub base (130mm/170mm respectively).
- 6 metre wide two coat bitumen seal.
- A 40mm AC seal across the intersection to allow for semi trailer turning path including a 30m metre taper left and right.

The road design was approved and a construction certificate issued by Oberon Council on 30 March 2005. Materials used in the construction of the road met RTA specification 3051 and compaction testing was completed and approved by Macquarie Geotech in accordance with AS 3798.

5.2 ASSESSMENT OF PAVEMENT DESIGN

The pavement design has been analysed using CBR and ESA information. The California bearing ratio (CBR) is a penetration test for evaluation of the mechanical strength of road subgrades and basecourses. The tests have been carried in accordance with AS1289. Equivalent Standard Axles (ESA's) are the number of standard axle loads which are equivalent in damaging effect on a pavement to a given vehicle or axle load.

A CIRCLY analysis has been performed on the above pavement using a design CBR of 10%, as recommended by Macquarie Geotech. The results of this analysis indicated that, for a 30 year design life, the pavement has a capacity of 6×10^6 ESA's (see **Appendix D**).

This is well in excess of the projected figure of 1×10^6 ESA's, therefore the current pavement on Ferndale Road has sufficient strength for 30 years to accommodate the projected increased volume in traffic.

6 CONCLUSION

It is considered that the Project as proposed would not have any significant detrimental effect on the performance or safety of the existing road network, or the intersection of Ferndale and Hampton Roads. It has also been assessed that the structural capacity of Ferndale Road is sufficient to accommodate the increased traffic levels over the life of the Project.

All relevant legislation, along with the RTA document “NSW Road Design Guide” and relevant Austroads guides, has been consulted when addressing the traffic issues.

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Appendices

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Appendix A Locality Sketch

Appendix B Plates

Appendix C BAL Intersection Details

Appendix D CIRCLY Analysis

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Appendix A

Locality Sketch

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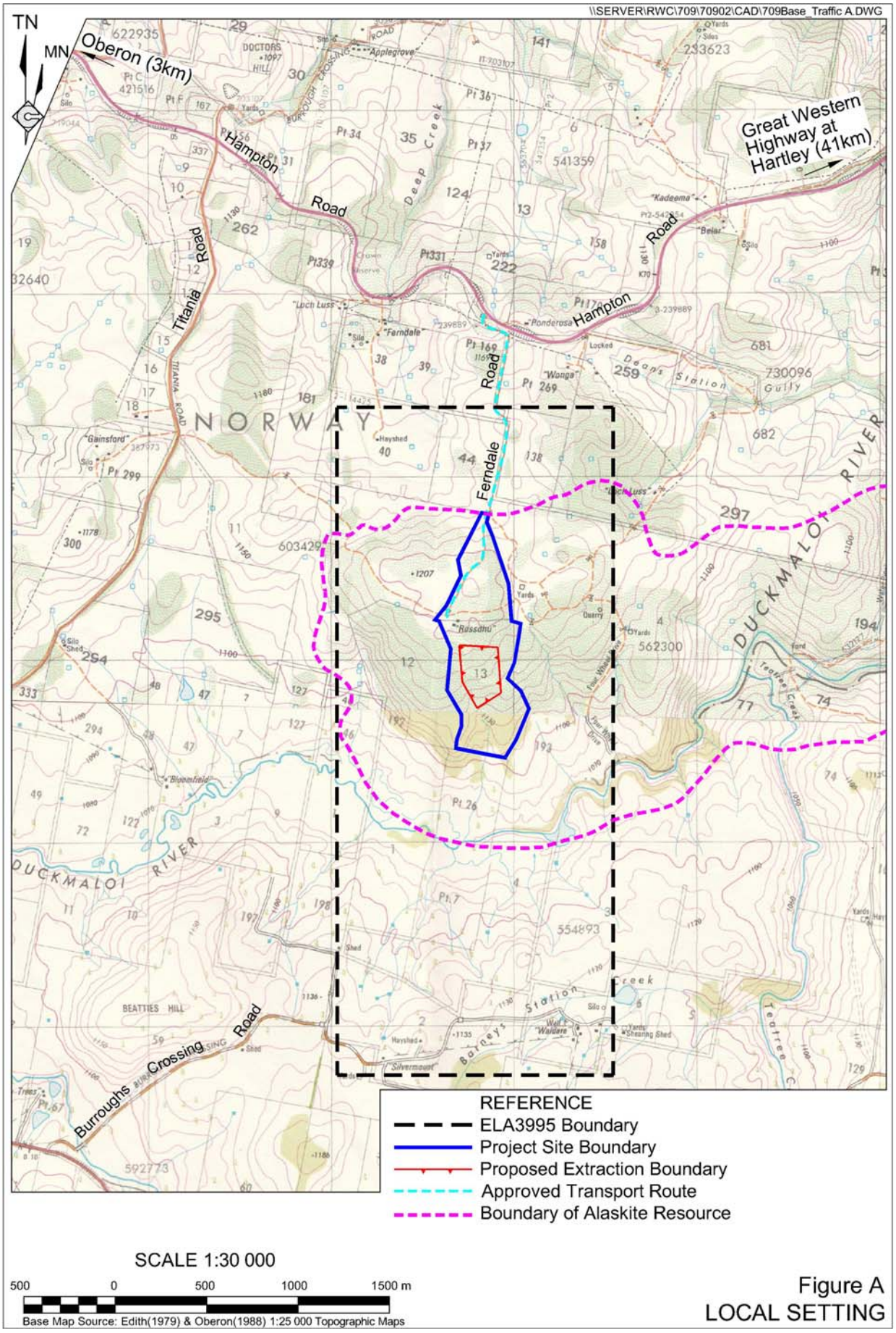

Figure A
LOCAL SETTING

Note: A colour version of this figure is included on the Project CD

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Appendix B

Plates

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Appendix C

BAL Intersection Details

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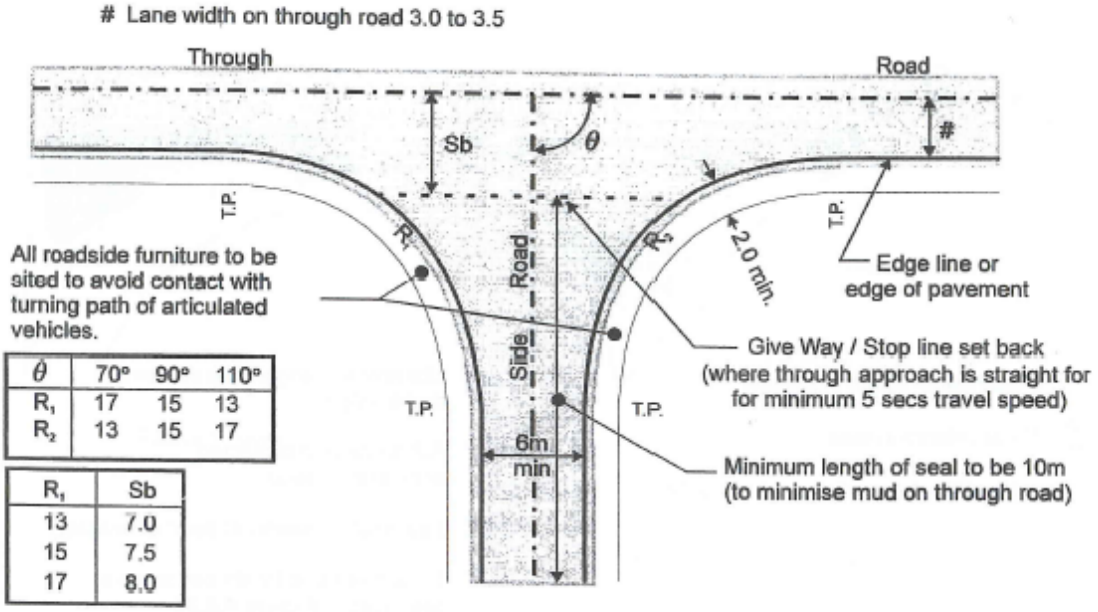
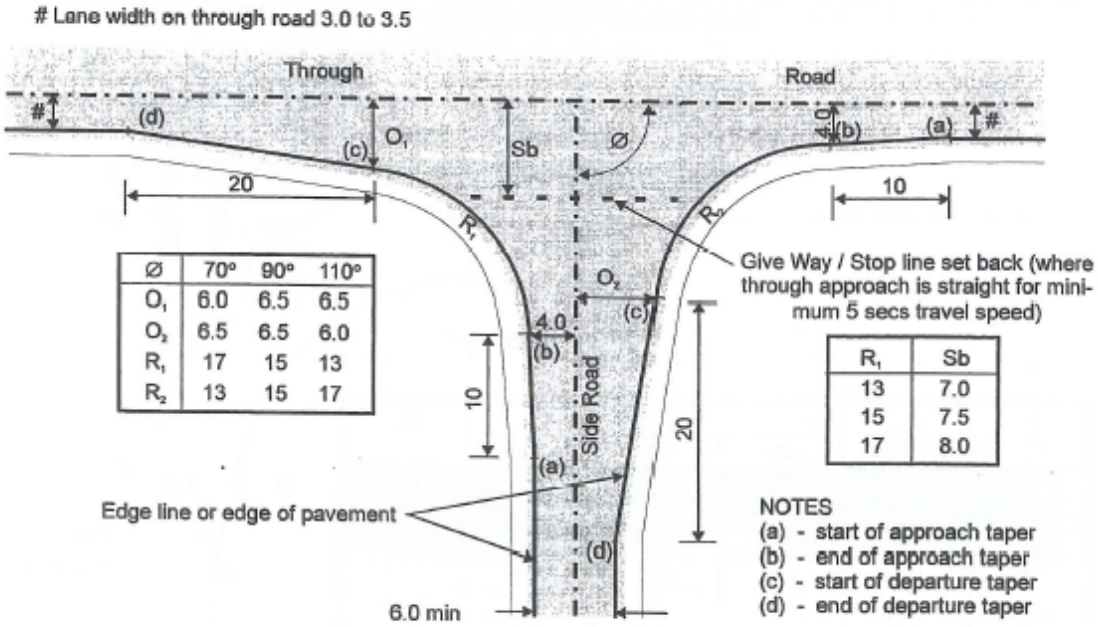


θ	70°	90°	110°
R_1	17	15	13
R_2	13	15	17

R_1	Sb
13	7.0
15	7.5
17	8.0

Figure 4.8.34 - Details of Type "BAL" Layout for Rural Sites where Side Road AADT < 50.



Ø	70°	90°	110°
O_1	6.0	6.5	6.5
O_2	6.5	6.5	6.0
R_1	17	15	13
R_2	13	15	17

R_1	Sb
13	7.0
15	7.5
17	8.0

Figure 4.8.35 - Details of Type "BAL" Layout for Rural Sites. where Side Road AADT ≥ 50 and / or specifically for articulated vehicles.

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Appendix D

CIRCLY Analysis

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12939.txt

CIRCLY Version 5.0j (23 October 2007)

Job Title: Oberon White Quarry

Damage Factor Calculation

Assumed number of damage pulses per movement:
One pulse per axle (i.e. use NROWS)

Traffic Spectrum Details:

ID: 2004-1 Title: Austroads 2004 - Example 1 - Unbound Granular Pavement

Load No.	Load ID	Movements
1	ESA75-Full	6.00E+06

MAX.

Details of Load Groups:

Load No.	Load ID	Load Category	Load Type	Radius	Pressure/ Ref. stress	Exponent
1	ESA75-Full	SA750-Full	Vertical Force	92.1	0.75	0.00

Load Locations:

Location No.	Load ID	Gear No.	X	Y	Scaling Factor	Theta
1	ESA75-Full	1	-165.0	0.0	1.00E+00	0.00
2	ESA75-Full	1	165.0	0.0	1.00E+00	0.00
3	ESA75-Full	1	1635.0	0.0	1.00E+00	0.00
4	ESA75-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: Aust2004-1 Title: Austroads 2004 - Example 1 - Unbound Granular Pavement

Layer No.	Lower i/face	Material ID	Isotropy	Modulus (or Ev)	P.Ratio (or vvh)	F	Eh	vh
1	rough	Gran_800	Aniso.	8.00E+02	0.35	5.90E+02	4.00E+02	0.35
2	rough	Gran_300	Aniso.	3.00E+02	0.35	2.20E+02	1.50E+02	0.35
3	rough	Sub_CBR10	Aniso.	1.00E+02	0.45	6.90E+01	5.00E+01	0.45

Performance Relationships:

Layer No.	Location	Performance ID	Component	Perform. Constant	Perform. Exponent	Traffic Multiplier
3	top	Sub_2004	EZZ	0.009300	7.000	1.600

Reliability Factors: Not Used.

Details of Layers to be sublayered:
Layer no. 1: Austroads (2004) sublayering
Layer no. 2: Austroads (2004) sublayering

Results:

Layer No.	Thickness	Material ID	Load ID	Critical Strain	CDF
1	130.00	Gran_800		n/a	n/a
2	170.00	Gran_300		n/a	n/a
3	0.00	Sub_CBR10	ESA75-Full	9.22E-04	9.07E-01

Gran-DGB 20 - 80% CBR
Gran 300 - Select 30% CBR
Sub-grade 10%

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TABLE 8.1 MECHANISTIC DESIGN PROCEDURE (Cont'd)

(c) Interpretation of Results

STEP	ACTIVITY	REFERENCE
14	Determine using the criteria selected in steps 7, 8 and 9 the allowable number of Standard Axles for each of the relevant distress modes	
or 14a	For specialised loading, determine using the criteria selected in steps 7, 8 and 9 the allowable number N_{ij} of load types i of magnitude j for each of the relevant distress modes	
15	For each distress mode, compare allowable number of standard axles with the design number of standard axles	Section 7
or 15a	For specialised loading, determine the following ratio for each axle configuration and load magnitude (n_{ij} / N_{ij}) where n_{ij} is the design number of axle configurations i of magnitude j and N_{ij} is as derived in step 14a Calculate the sum of ratios (n_{ij} / N_{ij}) for all axle configurations and load magnitude for each distress mode	Section 7.5
16	If, for all distress modes, the allowable number of standard axles exceeds the design number of standard axles, the pavement is acceptable. If not, it is unacceptable	
or 16a	For specialised loading, and for each distress mode, the summation of ratios obtained in step 15(a) does not exceed unity the pavement is acceptable. If it does (for any distress mode) the pavement is unacceptable.	
17	If the pavement is unacceptable or additional pavement configurations are required for comparison, select a new trial pavement, return to step 1 and repeat steps 1 to 16	
18	Compare alternative acceptable designs	Section 11

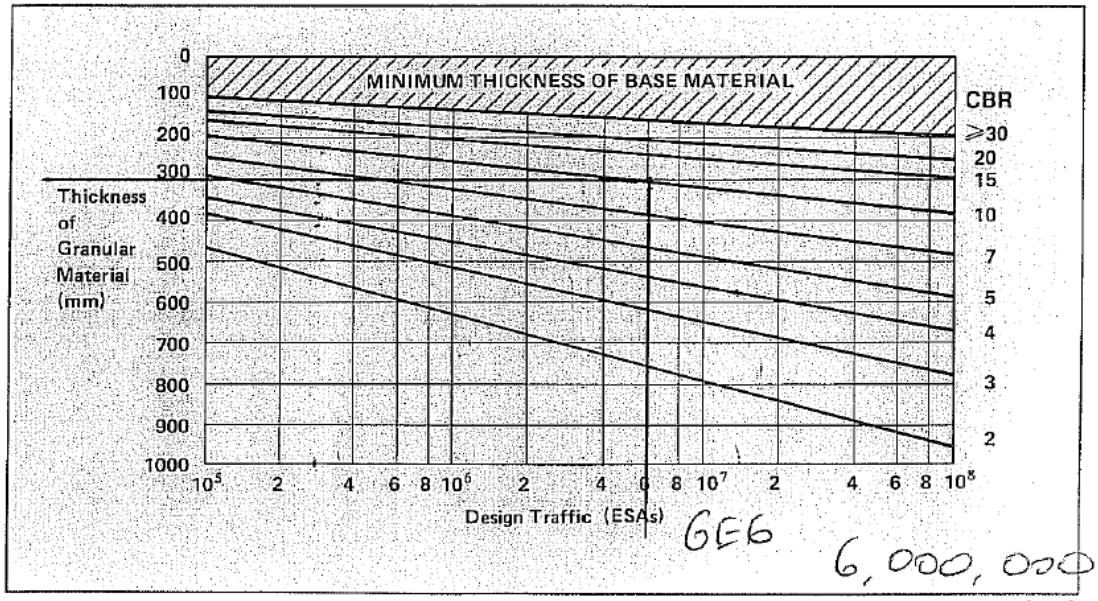
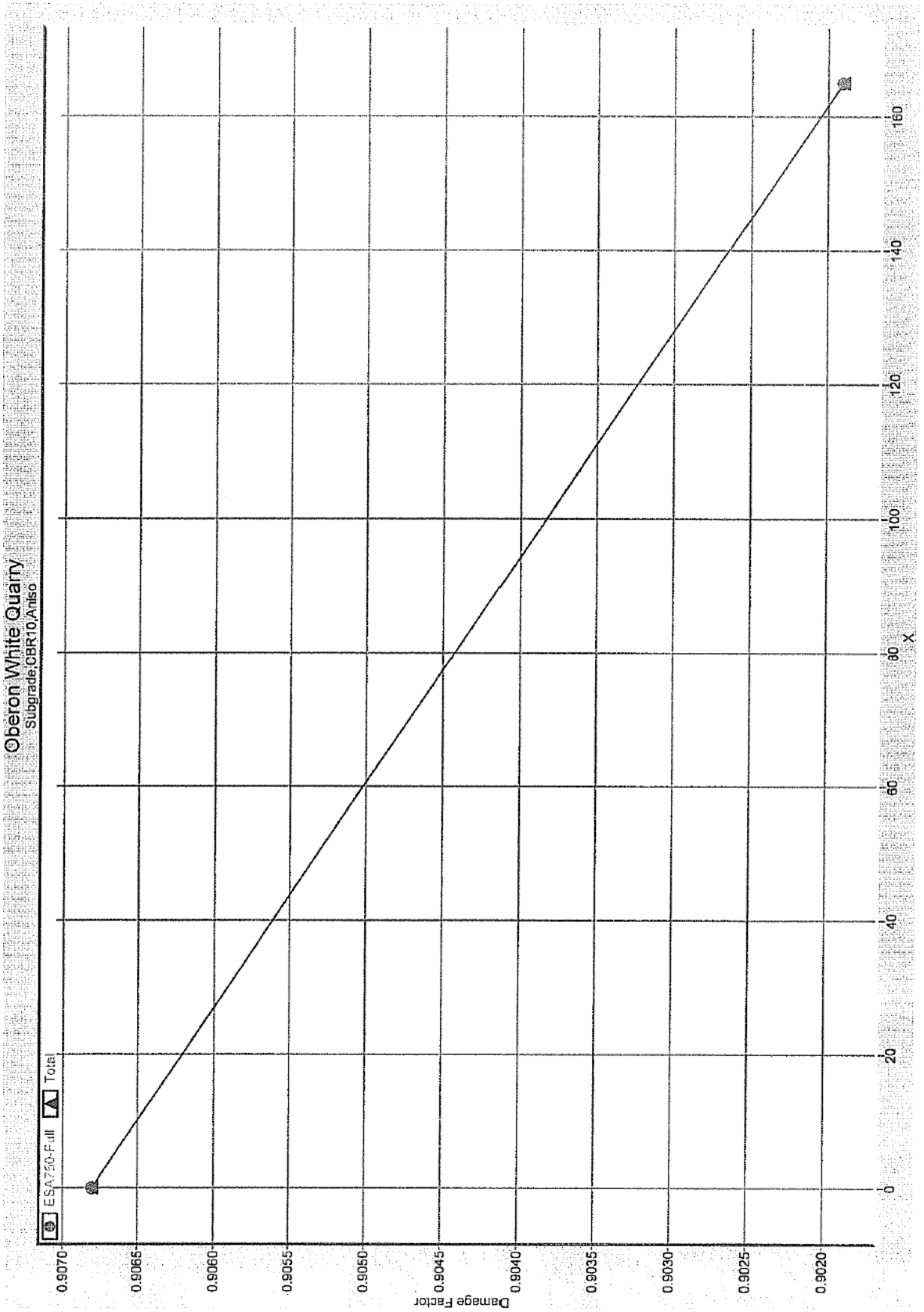


FIGURE 8.4 DESIGN CHART FOR GRANULAR PAVEMENTS WITH THIN BITUMINOUS SURFACING


Oberon White Quarry
Subgrade,CBR10,Aniso
ESA750-Full
Total
Damage Factor
0.9070
0.9065
0.9060
0.9055
0.9050
0.9045
0.9040
0.9035
0.9030
0.9025
0.9020
0
20
40
60
80
100
120
140
160
X

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