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MARTINS CREEK QUARRY

Report On Engineering & Transport

Prepared for: Buttai Gravel Pty Ltd

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QUALITY REVIEW

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01	Dec/2015	Report on Engineering & Transport	Bob Staniland	Joshua Rhodes
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Table of Contents

List of Figures

References

Reference 1 "Extraction Operation Plan", March 2016, prepared by Daracon

Reference 2 "Martins Creek Quarry- Heavy Vehicle Route and Market Assessment", prepared by Daracon Group.

Reference 3 "Water Quality Impact Assessment", March 2016, prepared by JM Environments.

Reference 4 "Stormwater Management Control Plan", December 2014, prepared by Daracon Group

Reference 5 "Pollution Incident Response Management Plan for Martins Creek Quarry, February 2015, Prepared by Daracon Group

Reference 6 Environmental Protection Licence No 1378 dated 11 November 2014

Reference 7 "Rail logistics Options for Martins Creek Quarry", June 2015, prepared by Plateway

Reference 8 "Traffic and Access Assessment", March 2016 prepared by SECA Solution.

Reference 9 Martins Creek Quarry Haul Routes – analysis of future pavement maintenance requirements resulting from a proposed increase in quarry truck traffic, October 2015, prepared by SMEC.

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1 Introduction

1.1 Background

1.1.1 ACOR Consultants was commissioned by Buttai Gravel Pty Ltd to assess engineering issues relating to the quarry site and transport of quarry products for the Martins Creek Quarry. This report forms part of an Environmental Impact Statement (EIS) supporting an application for increased quarry extraction.

1.1.2 The development proposal is a hard rock quarry operated by Buttai Gravel Pty Ltd at:

- Lot 1 DP1006375
- Lot 1 DP 204377
- Lot 42 DP 815628
- Lot 5 and 6 DP 242210
- Lot 21 DP773220

The quarry is accessed from Station Street, Martins Creek in the Dungog Shire Council LGA. Refer Figure 1- Locality Plan.

1.2 Purpose

The purpose and scope of this assessment and report is limited to those Secretary's Environmental Assessment Requirements (SEAR's) listed in 1.3 below which relate to site facilities, stormwater and road haulage. This report documents impacts of the proposed development and mitigation measures to be implemented.

1.3 SEAR's

Department of Planning and Environment (DPE) have issued the SEAR's for Application Number SSD6612. These detail inclusions in the EIS. Those which relate to the scope of this report are:

- A waste management strategy dealing with the EPA's requirements.
- A water management strategy dealing with the EPA's and Department of Primary Industries' requirements.
- Likely impacts on the existing environment by the development, using sufficient base line data.
- Likely impacts of all stages of the development including any cumulative impacts.
- Measures that would be implemented to mitigate and/or offset the likely impacts of the development, consistent with industry best practice and representing the full range of reasonable and feasible mitigation measures.
- Effectiveness of mitigation measures.
- Whether contingency plans would be necessary to manage residual risk.
- Measures implemented to monitor and report on environmental performance.
- A consolidated summary of proposed environmental management and monitoring measures.

- Detailed assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and state road network having regard to the requirements of Roads and Maritime Services (RMS), Dungog Shire Council (DSC), Maitland City Council (MCC) and Port Stephens Council (PSC).
- Measures or works that would be used and/or implemented to upgrade, maintain and improve the capacity, efficiency and safety of the road network used by the development.
- Potential impacts of the development on regional water supplies and infrastructure and licensed water users.
- Site water balance including demands, disposal methods, supply infrastructure and storage structures, discharge quantities and quality.
- Licensing requirements.
- Demonstrate that water for construction and operation can be obtained from an appropriately authorised and reliable supply.
- Measures to ensure operation with the requirements of water source embargo.
- Water management system, water monitoring program and other measures to mitigate surface and groundwater impacts.
- Consult with relevant authorities and address issues raised.

1.4 SEAR's Requirements

Requirements referenced in the SEAR's and Attachments are listed below with reference to this report where issues have been addressed.

1.4.1 The Environmental Protection Authority (EPA) advised by letter dated 9 October 2014 to the DPE of requirements detailed in letter Attachment 1. Relevant issues relating to the scope of this report and this report assessment references are:

EPA ISSUE	REPORT REFERENCE
1.2 Water Quality	2.3, 3.2
2.1 Section 45 of the POEO Act	2.3.4
2.2 Variation to the current EPL	2.3.1
The premises- pre coat plant	3.1.3
5.4 b) Erosion, sediment and leachate control	3.2
6.1.1 a) Soil erosion and sediment transport – in accordance with Managing Urban Stormwater: Soils and Construction , Vol 1 (Landcom 2004) and Vol 2E Mines and Quarries (DECC 2008)	3.2.8
6.1.2 Mitigation and management options that will be used to prevent, control, abate or minimise impacts, including effectiveness and reliability	3.2
6.2.1 Describe the proposal	2.1, 3.1
6.2.2 Demonstrate options to avoid discharge have been implemented and environmental impact minimised	3.2
6.2.2 Measures to divert clean water in creeks discharging to the Quarry Pit	2.4
6.2.3 Water balance where relevant, including water requirements, disposal, treatment, management and reuse	2.2.2

6.2.3 Demonstrate sufficient water captured for dust suppression purposes	2.2.2
6.3.1 & 6.4.2 Water Quality Objectives for receiving waters	2.3.2
6.4.1 Nature and degree of impact of discharges	2.2, 2.3
6.4.5 Description of stormwater management	2.2, 3.2
6.5.1 Monitoring of impacts	2.3, 3.2

1.4.2 The Department of Primary Industries (DPI) advised by letter to DPE of requirements from Crown Lands, NSW Office of Water (NOW) and Agriculture NSW. Relevant issues advised by NOW (relating to the scope of this report) and this report assessment references are:

NOW ISSUE	REPORT REFERENCE
• Details of water proposed to be taken from each surface water source	2.2.2
• Identification of an adequate and secure water supply for the life of the project	2.2.2
• A site water balance	2.2.2
• Assessment of impacts on surface water sources and measures to reduce and mitigate these impacts	2.2.2, 3.2
• Surface water monitoring	3.2
• Management and disposal of incidental water	3.2
• Final void management	2.2.2
• Cumulative impacts on water resources	2.2.2
• Flood management	2.2.2
• Description of site water use and management including sediment dams and diversion structures	3.2

1.4.3 The RMS advised by letter dated 1 October 2014 to DPE of their requirements. Relevant issues (relating to the scope of this report) and this report assessment references are:

RMS ISSUE	REPORT REFERENCE
• Relevant vehicular traffic routes and intersections and connections to the classified state road network	4.1, 4.2, 4.3
• Anticipated additional vehicular traffic	4.1
• Distribution on the road network of generated trips	4.1
• Traffic impacts on existing intersections	4.4.2

• Identify any road network infrastructure upgrades required to maintain existing levels of service	4.4

1.4.4 MCC advised by letter dated 26th September 2014 to DPE of their requirements. Relevant issues (relating to the scope of this report) and this report assessment references are:

MCC ISSUE	REPORT REFERENCE
• Impacts of heavy vehicles on the existing traffic network and residential amenity in Bolwarra Heights, Bolwarra and Lorn	4.4
• Encourage the use of the quarry rail siding	3.4
• Wear and tear and maintenance issues on the heavy vehicle route and financial contributions	4.4.3

1.4.5 PSC advised by letter dated 29 September 2014 to DPE of their requirements. Relevant issues (relating to scope of this report) and this report assessment references are:

PSC ISSUE	REPORT REFERENCE
• Impacts on local roads, deterioration and damage to road pavements	4.4
• Analysis of haul route/s intersection suitability and safety	4.4
• Amelioration or contributions to local road maintenance	4.4.3

1.4.6 DSC advised by letter dated 3 October 2014 to DPE of their requirements. Relevant issues (relating to scope of this report) and this report assessment references are:

DSC ISSUE	REPORT REFERENCE
1. Design life for flexible pavements typically 20 years. Some sections of pavement have been rehabilitated to a lesser standard	4.1.3
2. Traffic safety at intersections, squeeze points, rail crossings, narrow road sections etc.	4.4

3. Pedestrian safety through Martins Creek and Paterson	3.3.3, 4.4.2, 4, 5, 7
4. Traffic management through villages in peak times, level crossings and school bus route	4.4
5. Cumulative impacts on traffic from other quarries	4.1.2
• Station Street width, pavement dwellings and pedestrian access	4.4.4
• Station Street/Grace Avenue intersection rail crossing and long vehicle turning	4.4.4
• Martins Creek potential conflicts between heavy vehicles, pedestrians and road users	4.4.4
• Grace Avenue/ Dungog Road intersection capacity for right and left turns	4.4.5
• Gostwyck Bridge sight distance, approach grade, traffic management, detours and load restriction	4.1.2
• Dungog Road, rehabilitation works for narrow pavement, pavement strengthening and no shoulder	4.1.2, 4.4.2, 4.4.16
• On road heavy vehicle storage	4.4.12
• Dungog Road/ Gresford Road intersection capacity for right and left turns	4.4.6
• Gresford Road rehabilitation works for narrow pavement, pavement strengthening and no shoulder. Road is flood prone	4.1.2, 4.4.2, 4.4.16
• Gresford Road/ Church Street intersection sight distance	4.4.14
• Paterson Rail crossing traffic stacking and need for pre-emptive warning lights	4.4.14
• King Street/ Duke Street intersection long vehicle turns and traffic calming	4.4.7
• Duke Street/ Princess Street intersection narrow poor alignment, sight distance and pedestrian movements	4.1.2
• Maitland Road is flood prone adjacent John Tucker Park, rehabilitation works for pavement, realignment, widening and drainage. Proximity to constructed residences	4.1.2, 4.4.15

• Paterson potential conflict between heavy vehicles, pedestrians and road users	4.1.2, 4.4.2
• Tocal Road/ Paterson Road intersection turning movements, storage and traffic calming	4.1.2
• Tocal Road is flood prone, rehabilitation works for pavement and widening	4.4.15
• Paterson Road pavement widening and strengthening	4.1.2, 4.4.2, 4.4.16
• Martins Creek Road should not be considered for even unladen vehicle movements	3.3.2
• Reduced road life. Rehabilitation works to 10 year Capital Works Programs dependant on road maintenance contributions	4.4.3, 4.4.16
• Traffic counts and intersection turning definition	4.1.2, 4.4.2

1.4.7 Australian Rail Track Corporation (ARTC) advised by email dated 10 April 2015 of their requirements. Relevant issues (relating to the scope of the report) and assessment references to this report are:

ARTC ISSUE	REPORT REFERENCE
1. Tight turn by trucks causing screwing damage to pavement surface at rail crossing	3.3.3, 4.4.5
2. Potential for train collision with trucks due to conflict of truck movements at rail crossing	3.3.3, 4.4.5
3. Potential for train collision with pedestrians due to lack of pedestrian rail crossing	3.3.3, 4.4.5

1.4.8 Community groups representing Paterson, Bolwarra Heights, Wallalong and Woodville have advised DPE of their requirements. Relevant issues (relating to scope of this report) and this report references are:

COMMUNITY GROUP ISSUE	REPORT REFERENCE
• Transport should utilise high proportion of rail	3.4
• Hours of operation	2.1.6, 2.3.1
• There was an instance of peak traffic through Paterson of over 600 truck movement per day, 100 trucks per hour	2.1.3, 4.1.2
• Roads are being heavily damaged	4.4.3
• Cumulative effects of truck movements from both Martins Creek Quarry and Brandy Hill Quarry	4.1.2
• Consider school buses and children/bikes near Bolwarra Public School	4.1.17
• Speed limit on Tocal Road, Bolwarra Heights should be less than 60km/hr	4.4.18
• Some roads have no shoulders, footpaths or bike lanes	4.4.2

1.5 Issues Arising From Consultation

1.5.1 Consultation has been undertaken with Government Agencies to outline proposals and determine requirements. Meetings were minuted and are provided elsewhere by others. Details relating to engineering issues are summarised below with reference to this report where issues have been addressed. Other issues are addressed by others in relevant reports.

1.5.2 NOW provided advice at meetings on 28 January, 13 May and 23 September 2015.

ISSUE RAISED	REPORT REFERENCE
1. Confirmation of stream orders provided by NOW	2.4
2. Impact assessment of creek diversions	2.2.2
3. Options to stream intersection	2.1.2, 2.2.2
4. Final voids	2.2.2

1.5.3 RMS provided advice at the meeting on 4 February 2015.

ISSUE RAISED	REPORT REFERENCE
1. Distribution/ dispersion and numbers of trucks at New England Highway, East Maitland and Adelaide Street, Raymond Terrace	4.1.2
2. Identify current and proposed haulage routes, identify options and justify	4.1.2, 4.2
3.RMS is the authority for • Gostwyck and Vacy Bridges • Traffic signals	4.1.2
4. Use of B-double trucks	4.2.4
5. Design life of Gostwyck Bridge	4.1.2
6. Blackspot funding areas	4.1.2
7. Identify truck numbers for current and proposed development	4.1.2

1.5.4 MCC provided advice at the meeting on 20 February 2015.

ISSUE RAISED	REPORT REFERENCE
1. Potential haulage route on Paterson Road from Tocal Road to Woodville Bridge	4.1.2, 4.2
2. Council has secured $2m Fixing Country Roads Grant to upgrade Tocal Road	4.4.3
3. Estimated minimum forward budget for regional road network is $0.5m per year	4.4.3
4. Rebuilding of roads is to new standards	4.4.3

5. Council is to investigate condition of culverts	4.4.3
6. Mindaribba embankment is narrow formation	4.4.3
7. Blackspot funding	4.4.3
8. Community issues include bus stop areas for school busses	4.4.2

1.5.5 PSC provided advice at the meeting on 31 March 2015.

ISSUE RAISED	REPORT REFERENCE
1. Potential haulage route via Wallalong/ Hinton	4.2
2. Council has concerns with condition of Butterwick Road and its intersections	4.4.2, 4.4.8, 4.4.10
3. Council is reviewing bus stop safety at Brandy Hill	4.4.2

1.5.6 DSC provided advice at the meeting on 25 February 2015.

ISSUE RAISED	REPORT REFERENCE
1. Low level crossing over the Allyn River for alternate route via Vacy	4.1.2
2. Truck parking in Grace Avenue	4.4.12
3. Assessment of roads is to include impact on roads, costs, current status, upgrade intentions and tonnages compared to the last 10 years	4.4.3
4. Council has identified issues a) Station Street pavement, drainage, width	3.3.3, 4.4.4
b) Safety of Martins Creek level crossing	3.3.3, 4.4.4
c) Parking in Grace Avenue	4.4.12

d) Use of Martins Creek Road rail bridge	3.3.2
e) Traffic backup at Paterson level crossing	4.4.14
f) Intersection of King and Duke Street, Paterson	4.4.7
g) Prince Street curve	4.4.2
h) Use of Paterson back streets during times of flood	4.2

2 Quarry Operations

2.1 Extraction

2.1.1 Reference is made to the documents:

- "Extraction Operations Plan" dated March 2016, prepared by Daracon Group (Reference 1).
- "Martins Creek Quarry- Heavy Vehicle Route and Market Assessment", prepared by Daracon Group (Reference 2).

2.1.2 Reference 1 addresses:

- Geology
- Extraction staging
- Water and stream management
- Road, rail and surface facilities

2.1.3 Reference 2 addresses:

- Product delivery distribution
- Delivery routes
- Quarry material categories and distribution
- Markets and controls
- Delivery restrictions
- Production demands
- Trucking delivery times and movements

2.2 Stormwater

2.2.1 Reference is made to the documents:

- Water Quality Impact Assessment, March2016, Prepared by JM Environments (Reference 3)
- Stormwater Management Control Plan, December 2015, Prepared by Daracon Group (Reference 4)
- Pollution Incident Response Management Plan for Martins Creek Quarry, February 2015, prepared by Daracon Group (Reference 5)

2.2.2 Reference 3 addresses:

- Relevant SEAR's

- Relevant requirements of government agencies
- Surface and ground water
- Impacted streams
- Water quality and discharges
- Management systems
- Existing and proposed sediment dams
- Licencing requirements
- Site water balance and discharges

2.2.3 Reference 4 addresses:

- Water demands
- Erosion and sediment control
- Environmental risk
- Water quality
- Dams and treatment
- EPL compliance

2.2.4 Reference 5 addresses:

- Risk assessment
- Ranking of potential pollution incidents
- Preventative measures
- Incident control responses

2.3 EPA Licence and Requirements

2.3.1 Reference is made to the EPA Environment Protection Licence (EPL) no 1378 dated 11 November 2014 (Reference 6).

2.3.2 The EPL contains various conditions and restrictions relating to the discharge of water. There are three discharge points, one at each of Dams 1, 2 and 3. The locations of the Dams are shown in Figure 2 Location of Dams as referenced in the EPL.

A future Dam 4 will be created in the eastern pit and will require a new licenced discharge point.

Pollutant 100 percentile concentration limits are:

- Oil and grease- 10 milligrams per litre and none visible.
- pH- 6.5-8.5.
- Total suspended solids (TSS) - 50 milligrams per litre.

2.3.3 The EPL includes Pollution Reduction Program 5- Construction of a wheel wash. Specific requirements are:

- Construct and effective wheel wash at the exit to the premises, by 31 May 2015.
- Ensure all vehicles exiting use the wheel wash, by 30 June 2015.
- Report on completion of works to EPA, by 31 July 2015.

2.3.4 The Protection of the Environment Operations ACT 1997 (POEA Act) Section 45 requires consideration of:

- The pollution caused or likely to be caused and the likely impact on the environment.
- The practical measures taken to prevent, control, abate or mitigate that pollution and to protect the environment from harm as a result of pollution.

The site stormwater management system as detailed in Reference 4 prevents and controls water pollution and protects the environment from harm. This includes water discharge from the site in accordance with the EPL.

2.4 Impacted Watercourses

2.4.1 Surface water management is detailed in Reference 3.

2.4.2 Extraction will intercept first, second and third order streams which are shown in Figure 3, Stream Order.

3 Quarry Site

3.1 Facilities

3.1.1 Extraction areas are detailed in Reference 1.

3.1.2 The plant area incorporates facilities and operations for:

- Crushing and screening plant.
- Conveyors.
- Product stockpiles.
- Workshop, truck wash, stores and fuel storage.
- Pug mill.
- Bitumen precoat plant.
- Offices and personnel facilities.
- Weighbridge.
- Truck wheel wash.
- Dams, water treatment and pump facilities.

The quarry plant areas are shown in Figure 4A Quarry Plant Areas and Figure 4B Stockpile Area Plan.

3.1.3 The aggregate precoat plant applies a precoat of bitumen and adhesive agent to aggregates used in bituminous road sealing. Specific correct application rates are applied to ensure bonding to the aggregate with no washoff. The stockpiled aggregates of various sizes are subject to testing to RMS test method T238 using bitumen class 170.

The precoat plant is located at the low point in the quarry plant area so there is no surface stormwater runoff. Bitumen storage is within an appropriate bunded area. There is no pollution generated by the pre coat plant.

3.1.4 A vehicle wheel wash is located near the site access.

3.2 Water Management

3.2.1 Reference is made to the Stormwater Management Control Plan (Reference 4) and the EPL (Reference 6).

3.2.2 The philosophy of surface stormwater management on the site is:

- Provision and operation of facilities in accordance with the EPL.
- Separation and diversion of runoff from clean catchments.
- Collection and conveyance of runoff from three major contaminated catchments to sediment dams for storage.
- Treatment of five minor contaminated catchments by usual erosion and sediment controls.
- Monitoring and treatment of water stored in dams prior to pumped discharge release.

3.2.3 EPL compliance relating to stormwater requires:

- Provision and operation of Dams 1, 2 & 3.
- Monitoring and recording of water quality at dam discharge points prior to discharge.
- Treatment of water stored in dams as required for oil/grease, pH and TSS.
- Submission of annual returns.
- Notification of environmental harm.
- Provision and operation of vehicle wheel wash.

The quarry facilities and operations for stormwater management comply with the EPL.

3.2.4 Monitoring and testing of water captured in the three sedimentation dams is undertaken after treatment and prior to release. Testing is undertaken by NATA certified laboratory to confirm compliance of the water quality criteria for oil/grease, pH and TSS, corresponding to the EPL, prior to pumped discharge. Testing is repeated every 24 hours during the discharge event.

3.2.5 Dams collect and store stormwater runoff from the quarry operational areas consisting of three catchments. These are:

- Dam 1 catchment incorporating the northern plant area of crusher, screens, conveyors, stockpiles, precoat plant, pugmill, workshop and fuel store.
- Dam 2 catchment incorporating the southern plant area of stockpiles, offices and facilities, weighbridge, truck wheel wash and stores.
- Dam 3 catchment incorporating the west pit extraction area.
- Future Dam 4 catchment incorporating the east pit extraction area.

3.2.6 Water treatment is undertaken by the addition of coagulant and acid at Dam 1 to achieve the EPL criteria, prior to discharge from Dam 1. Water from Dam 2 is pumped to Dam 1 for discharge. Discharge from dam 3 is generally not required as water usage for road dust suppression provides sufficient drawdown.

3.2.7 There are five small catchments which do not drain to dams. These catchments are:

- Area 1 prestrip area which has been revegetated and stabilised.
- Area 2 quarry access road which has been stabilised and erosion control measures employed.
- Area 3 quarry haul road which has erosion control measures employed.
- Area 4 prestrip area which has been revegetated, stabilised and erosion control measures employed.
- Area 5 northern diversion bund which has been stabilised and erosion control measures employed.

3.2.8 Erosion and sediment controls employed on the site include sediment fence, rock check dams, straw bales, geofabric/ rock armouring and sediment basins. Disturbed areas are topsoiled and hydro mulch revegetated. These measures are continuously monitored, desilted and maintained. All works are in accordance with;

- "Managing Urban Stormwater: Soils and Construction, Landcom, 4th Edition March 2004".
- "Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries, DECC 2008".

3.2.9 A vehicle wheel wash has been installed in accordance with the current EPL at the weighbridge at the quarry exit, preventing the tracking of mud and debris onto roadways. The wheel wash and weighbridge will be relocated to a new location when the quarry access in changed.

3.2.10 Other matters relating to water management have been addressed in Reference 3.

3.3 Site Access

3.3.1 Access to the development site is via Station Street for truck entry and exit movements.

On rare occasions, short term access is achieved via Vogeles Road for equipment low loader haulage and truck product haulage during rail wagon loading, when the rail wagons queue across the Station Street road access.

3.3.2 Alternative site access options have been identified and assessed. Details and outcomes are shown in Table 1.

Table 1- Site Access Options

OPTION	DESCRIPTION	FIG	ADVANTAGES	DISADVANTAGES	DETERMINATION
1.	Existing Station Street & Grace Avenue		• Existing	• Adjacent houses • Residential street • Road pavement & drainage problems • Council identified issue	Not preferred
2.	East side of rail siding joining Grace Avenue Provide acoustic mound		• Greater distance from Station Street houses • Avoids Station Street • Improved acoustics for houses in Station Street • Improved access to rail crossing	• Difficult alignment • Closer proximity to houses in Grace Avenue	Not preferred
3.	Cory Street, reconstructed rail bridge, Martins Creek Road to Paterson Road		• Avoids Station Street	• Heavy traffic through Cory Street residential • ARTC delay to reconstruction of rail bridge • Poor condition of Martins Creek Road • Load limitation • Council refusal	Abandoned
4.	Exit near Vogeles Road, new haul road via transmission easement and private property to Black Rock Road, Martins Creek Road to Paterson Road		• Avoids Station Street	• Absence of ownership • Poor condition of Black Rock Road and Martins Creek Road • Load limitation • Council refusal	Abandoned
5.	Exit Vogeles Road, Grace Avenue		• Avoids Station Street • Improved access to rail	• Heavy traffic through Cory Street residential	Abandoned

			crossing		
6.	New access via quarry pit west, new rail bridge to Dungog Road		• Avoids Station Street and residential • Avoids rail crossing		Preferred

3.3.3 A new development site access to Dungog Road is proposed to be constructed within 2 years. This will involve the construction of new haul road, bridge crossing of the rail line and intersection at Dungog Road. Details are shown at Figure 5A Proposed New Site Access – Plan and Figure 5B Proposed New Site Access - Bridge

The existing access at Station Street will then cease to be used for general truck haulage.

3.3.4 Heavy vehicle storage will be incorporated in the new development site access haul road works to remove parked trucks from public roads.

3.4 Rail Transport

3.4.1 Reference is made to the document Reference 7 “Rail Logistics Options for Martins Creek Quarry.”

3.4.2 The current rail siding layout is suitable for loading ballast trains operated by ARTC in the Hunter Valley but is too short for the operation of longer ballast trains and aggregate trains (up to 1000m in length) serving non railway markets.

3.4.3 An improved layout would involve extending the length of track beyond the bin for around 200m to provide at least 400m of storage past the loading point.

3.4.4 The use of ballast trains is restricted by rail line capacity, limited loading hours and market preference. The use of rail for the transport of aggregates is currently not viable. Only 2.5% of total production is transported by ballast train

4 Road Transport – Description

4.1 Traffic and Road Pavements

4.1.1 Reference is made to the documents:

- Traffic and Access Assessment, March 2016, prepared by SECA Solution (Reference 8)
- Martins Creek Quarry Haul Route – analysis of future pavement maintenance requirements resulting from a proposed increase in quarry truck traffic, October 2015, prepared by SMEC (Reference 9)

4.1.2 Reference 8 addresses:

- review of traffic impacts external to the quarry
- advises on capacity, efficiency and safety issues associated with the road network
- assesses impacts on the local road network due to additional traffic flows predicted for quarry extraction increasing from current to proposed 1.5 million tonnes per annum
- documents the impacts and advises on mitigation measures
- describes roads which constitute the haul routes

- identifies current and predicted traffic flows
- assesses road safety and identifies intersection upgrades

4.1.3 Reference 9 addresses:

- determination of increased maintenance requirements and maintenance costs associated with the increased truck traffic that would result from extending quarry extraction production from current to 1.5 million tonnes per annum over the next 25 years.
- determination of the current condition of road pavement along the haul routes.
- modelling of pavement deterioration and optimal maintenance to maintain current condition level for both current and increased truck traffic.
- Future funding required to maintain current road pavement condition level due to increased traffic.

4.2 Transport Routes

4.2.1 The current primary routes are shown in Figure 6 – Road Transport Routes and are described as:

- Haul Route 1 - Station Street, Grace Avenue, Dungog Road, Gresford Road, Tocal Road, Paterson Road, Flat Road, Melbourne Street East Maitland.
- Haul Route 1 (Alternative) - Station Street, Grace Avenue, Dungog Road, Gresford Road, Tocal Road, Paterson Road, Belmore Road, High Street Maitland.
- Haul Route 2 - Station Street, Grace Avenue, Dungog Road, Gresford Road, Tocal Road, Paterson Road, Butterwick Road, Clarence Town Road, Brandy Hill Drive, Seaham Road, William Bailey Street, Raymond Terrace.

4.2.2 It is proposed that truck movements will be diverted from Belmore Road (Haul Route 1 Alternative) to Flat Road (Haul Route 1)

4.2.3 Infrequent routes involving low traffic volumes and frequencies are also utilised when required by market location and road access limitation, including:

- Via Horns Crossing Road and Gresford Road through Vacy due to temporary maintenance closure of Gostwyck Bridge on Dungog Road.
- Various local roads.

4.2.4 The transport routes are not designated for B-Double trucks.

4.3 State Roads

4.3.1 The primary transport routes connect to the classified state road network at Melbourne Street East Maitland, High Street Maitland and William Bailey Street Raymond Terrace.

4.4 Haul Routes Road Infrastructure

4.4.1 Road infrastructure on the local road network utilised for transport by the development has been assessed and quantified so that mitigation/offset measures or works can be identified to upgrade, maintain and improve capacity, efficiency and safety. Apportionment of cause and impacts by quarry heavy vehicle has been quantified

4.4.2 Impacts on traffic and pedestrian safety are identified in Reference 8. In particular:

- There are no pedestrian or cyclist facilities along the majority of the length of the haul routes. The exceptions are the urban areas of Paterson, Bolwarra Heights, East Maitland and Raymond Terrace. Truck haulage traffic has no adverse impacts.

- Truck haulage traffic travel slower than light vehicles and typically travel within the posted speed limit.

- The haulage route road network operates well with minimal delays and congestion, except at Melbourne Street, East Maitland (which is an existing problem independent of quarry haulage vehicles).

- The haulage routes have been reviewed under the guidelines for the preparation of Road Safety Audits published by Austroads. RMS accident data has revealed no recorded accidents associated with the quarry trucks. Overall, the road network is satisfactory for road safety issues.

- Road safety review has identified concerns with existing intersections at Dungog Road/ Gresford Road, Butterwick Road/ Clarencetown Road and Brandy Hill Drive/ Clarencetown Road, due to lack of current design standards requirement for dedicated sheltered right turn lane. Duke/ King Street intersection requires median guidance for vehicle manoeuvres. However, these are existing safety issues which do not have a nexus to quarry haulage vehicles.

- Butterwick Road has a general lack of shoulders requiring widening to satisfy current design standards. However, this is an existing safety issue which does not have a nexus to quarry haulage vehicles.

- Tocal Road at Bolwarra Heights has a narrow pavement width requiring parking restriction. However, this is an existing safety issue which does not have a nexus to quarry haulage vehicles.

4.4.3 Impacts on road pavements are identified in Reference 9. In particular:

- Current condition of quarry truck haulage route roads has been determined.

- Optimised maintenance has been determined for haulage route road pavements subjected to increased haulage traffic resulting from increased quarry extraction production.

- Future funding required to maintain the current road pavement condition level has been determined and reported as dollar cost per tonne of quarry material.

4.4.4 Upgrade of the Station Street/ Grace Avenue intersection and associated upgrade of the rail crossing will not be required because a new development site access is proposed to be constructed intersecting Dungog Road.

4.4.5 Upgrade of the Grace Avenue/ Dungog Road intersection is not required because a new development site access is proposed to be constructed at Dungog Road, removing heavy vehicle traffic from the existing intersection.

4.4.6 Upgrade of the Dungog Road/ Gresford Road intersection is identified in Reference 8. Details are shown in Figure 7 Dungog Road/ Gresford Road Intersection Works.

4.4.7 Upgrade of the Duke Street/ King Street Paterson Intersection is identified in Reference 8. Details are shown in Figure 8 Duke Street/ King Street Paterson – Intersection Median Works.

4.4.8 Upgrade of Butterwick Road/ Clarencetown Road intersection is identified in Reference 8. Details are shown in Figure 9 Butterwick and Clarancetown Road Intersection Works.

4.4.9 Upgrade of Brandy Hill Drive/ Clarencetown Road intersection is identified in Reference 8. Details are shown in Figure 10 Brandy Hill Drive and Clarancetown Road Intersection Works.

4.4.10 Shoulder widening at Butterwick Road is identified in Reference 8.

4.4.11 Parking restriction in Tocal Road, Bolwarra Heights is identified in Reference 8.

4.4.12 On road heavy vehicle storage is utilised on occasions, particularly early mornings at Station Street and Grace Avenue prior to start of quarry operations. This impact will be mitigated by the new development site access proposed to be constructed at Dungog Road. Heavy vehicle storage will be provided on site.

4.4.13 Upgrade for the rail crossing at Station Street/ Grace Avenue, Martins Creek will not be required because a new development site access is proposed to be constructed at Dungog Road.

4.4.14 Impacts of queuing traffic at the Gresford Road Paterson rail crossing are identified in Reference 8. It is considered that the provision of warning lights is not warranted by the development heavy vehicle traffic.

4.4.15 Sections of public road on the transport routes have been identified as flood prone. The flood liability of public roads is not impacted by traffic. Quarry operations cease during high rainfall and transport by heavy vehicle ceases when public roads are flooded.

4.4.16 Road pavement life for current and future traffic is addressed in Reference 9.

4.4.17 Impacts of heavy vehicle traffic on Paterson Road through Bolwarra in the vicinity of the Public School are not identified in Reference 8 as a safety issue.

4.4.18 The current speed limit on Tocal Road through Bolwarra Heights is 60kph. RMS is the authority responsible for speed limits on public roads and has declined by letter dated 18 March 2015 to MCC to lower the existing speed limit. However, heavy vehicles from the quarry development are subject to a self-imposed limit of 40kph through this section of Tocal Road.

FIGURES