Rail Logistics Options for Martins Creek Quarry

For

Buttai Gravel Pty Ltd.

Plateway Pty Ltd
ABN 61 080 595 919
Unit 6/3 Sutherland Street
Clyde NSW 2142
Australia
Tel: +61 2 9637 5830
Fax: +61 2 9637 6350
Web: www.plateway.com.au

Version	Date	Author/Reviewer	History
1.5	22/06/15	P. Imrie / S. Brownsmith	Initial Issue following client review

Table of Contents

1 Executive Summary 3
2 Introduction 4
2.1 Scope 4
2.2 Background and Experience 4
2.3 Glossary and Abbreviations 4
3 Background 5
3.1 Functions of Ballast 5
3.2 Characteristics of Railway Ballast 6
3.3 Operations for State Rail Authority of NSW 7
3.4 Railway Assets and Current Operation at Martins Creek 8
4 Rail Network Access 10
4.1 Current Rail Network Arrangements in the Hunter Region 10
4.2 Rail Network Capacity 10
5 Market Conditions 12
5.1 Current Aggregates Market Served by Martins Creek Quarry 12
5.2 Current Market for Railway Ballast 12
5.3 Potential Train Consists 13
5.4 Rail Transport of Aggregates 15
6 Conclusions and Recommendations 18
6.1 Conclusions 18
6.2 Recommendations 18
7 References 19
7.1 Reference Listing 19

1 Executive Summary

Ballast is a vital component of the rail track structure. Good clean ballast assists not only in enabling the railway to fulfil its basic transportation function, but also contributes to a low environmental impact from rail operations through reduced noise, and reduced potential for erosion of subgrade materials. There are limited sources of aggregate suitable for use as railway ballast, especially those able to be loaded directly into trains for distribution which is the preferred method of delivery for most railway works.

The use of direct rail delivery and distribution of ballast has the least environmental footprint of any ballast distribution logistics solution but is becoming increasingly difficult as a result of availability of rail wagons, the cost of ad hoc locomotive hire, rail network congestion and restrictions on loading at rail served quarries which are increasing the use of road served temporary stockpiles.

The importance of maintaining a rail delivery option for ballast is especially significant for the portions of the rail network which are adjacent to waterways (Hawkesbury River – Woy Woy) and National Parks (Sandy Hollow – Coggan Creek).

The current layout at Martins Creek is suitable for loading the ballast trains operated by ARTC in the Hunter Valley but is too short for the operation of longer trains and aggregate trains serving non railway markets. These would typically operate at up to 1000m in length.

The North Coast line, to which Martins Creek Quarry is connected, has sufficient network capacity to support the current and increased use of rail transport of ballast and aggregates from Martins Creek Quarry.

However, the Hunter Valley and electrified passenger areas do not have the same level of capacity and the imposed restrictions on evening and night loading at Martins Creek is halving the utilisation of the ARTC ballast trains and doubling the fixed cost of rail ballast distribution. This provides an incentive for the rail networks to deliver the ballast by road to temporary stockpiles for distribution. Were Martins Creek to be used to load aggregate for the general construction industry then evening and night time loading would be essential to produce a cost advantage for the rail logistics chain.

The ability to transfer the current aggregate output from road to rail in the Hunter Region is not possible due to the large number of customers and small volumes being delivered to each.

To enable a rail based logistics option to be competitive in the current market against the road based logistics chains associated with other sources of aggregates suitable for construction purposes, the market share and size would have to allow a throughput of over 1.2 million tonnes per annum.

2 Introduction

2.1 Scope

The scope of this study is to assess: -

- Deriving a rail logistics model and rail haulage cost model using various types of wagons including the existing ballast wagons, side dump wagons and a containerised solution which distributes quarry products to a series of hub locations using a variety of rail wagon options;
- The likely availability of access to the rail network for railing of ballast and general construction aggregate;
- The likely market which could be served using rail logistics including an assessment of the likely ARTC and Transport for NSW demand for ballast and aggregate over the life of the Development Application; and,
- An order of magnitude cost estimate to provide rail access to the required rail unloading facilities to replace the current road served market at Martins Creek with line rail haulage.

2.2 Background and Experience

This report has been prepared by Phillip Imrie BE Civil, MBA.

Phillip has over 30 years of experience in the Australian Railway Industry having started as an engineering cadet with the then State Rail Authority of NSW. During the early 1990's Phillip was responsible for the track upgrading program for the northern region of CityRail between North Strathfield and Newcastle.

Subsequent to this, Phillip was responsible for track renewals throughout regional NSW. After leaving the State Rail Authority of NSW in 1997, Phillip has continued to work in the railway industry and has previous experience in rail logistics on several major assignments in the Hunter region and NSW.

2.3 Glossary and Abbreviations

Table 1 Terms and their meanings

Term	Meaning
ARTC	Australian Rail Track Corporation. A corporation owned by the federal government which has leased the interstate mainlines and the Hunter Valley Coal network.
Throughput	Material transported by the logistics chain.
TfNSW	Transport for NSW, the state government department which owns the rail network.
Mtpa	Million tonnes per annum.

3 Background

3.1 Functions of Ballast

The railway network fulfils an important role in the NSW Transport Network in providing the heavy lift capacity for passengers and freight. Were the railway network to cease to function then there would be significant additional community and environmental impacts created by increased use of road transport.

Ballast fulfils several important functions on a railway line. Good clean ballast contributes to railway safety by:

- Distributing the load of the rail vehicles on the formation;
- Protecting the sleepers from damage and loss of function;
- Maintaining the track geometry within safe operating limits; and,
- Preventing track movement during periods of hot weather.

Ballast which is in good condition and is fulfilling its function also contributes to lessening the environmental impact of the railway through:

- Lower energy consumption by rollingstock;
- Lower wear rates of steel and copper components;
- Less noise generated; and,
- Reduced risk of formation failure and consequent soil particulate transportation.

The use of rail logistics from a direct served rail quarry to supply ballast on a “just in time” basis also has significant benefits including reduced:

- Truck movements on local roads;
- Use of temporary stockpiles in residential areas and attendant dust and noise impacts; and,
- Periods of line closure and use of alternative bussing arrangements.

Extended line closures for maintenance and the associated increased road traffic has been a significant source of complaint from the community surrounding railway lines over a long period time, especially the ongoing use of alternative bussing arrangements when the railway is closed.

Figure 1 Temporary aggregate stockpile at Clyde November 2014

Historically, ballast trains have been loaded at rail served quarries on a 24 / 7 basis around the year as the key driving function has been to ensure that there is continuity of rail operations. The inability to access a rail served quarry is an incentive to use temporary stockpiles. These frequently have to be placed in locations in close proximity to residences and accessed from portions of the road network not designed for frequent heavy vehicle use. Figure 1 shows a temporary stockpile located on the rail corridor in a location which involves compromises in safe access and potentially adverse environmental impacts.

3.2 Characteristics of Railway Ballast

To be suitable for use as railway ballast, rock has to conform to a series of specific requirements which contribute to the ability of the ballast to fulfil its functions. These requirements are detailed in *AS 2758.7 – Aggregates and rock for engineering purposes Part 7: Railway ballast* as well as adaptions of this standard published by the various railway organisations.

Table 2 Desirable ballast properties

Attribute	Desirable Characteristics
Strength	The ballast must be strong enough to support the loadings at the bottom of the sleeper. In the Hunter Network this means that at the sleeper interface, an area of around 0.05 sq. metres has to support a load of up to 15 tonnes.

Attribute	Desirable Characteristics
Grading	The ballast grading must be such that it can be packed but still contain sufficient voids to allow free drainage.
Particle shape	The particles must be angular and interlock.
Resistance to Abrasion	The ballast must retain its shape and the particles must be resistant to mechanical abrasion in both a wet and dry state.
Chemical stability	The stone has to be resistant to weathering once in contact with the atmosphere and rain water.

There are several environmental as well as commercial consequences of using inferior materials as railway ballast, including:

- Extended railway service disruption;
- Additional sediment running into water courses as the particles break down and erode; and,
- Potential change in water chemistry due to the breakdown of ballast.

Not all sources of aggregate are suitable for use as railway ballast and there are often compromises which have to be made regarding ballast quality based on cost and availability. The choice of sources for railway ballast is therefore far more limited than the choice of sources for aggregates for construction materials. The cost of transport and distribution favours a location which is located on the railway network in a suitable central location which further limits the available sources of aggregate.

3.3 Operations for State Rail Authority of NSW

Martins Creek Quarry provided the main source of ballast and aggregates for an area bounded by Hawkesbury River in the south, to Aberdeen and Wauchope in the north and Ulan in the west. This represents about 10% of the NSW Rail Network and some of the busiest lines in NSW including the Main Newcastle to Sydney passenger lines and the Hunter Valley Coal Network.

Significant portions of this length such as the sections between Hawkesbury River and Woy Woy, Sandy Hollow to Coggan Creek and Gloucester to Wingham, are not accessible by road relying solely on rail delivered ballast for all maintenance and renewal requirements. These areas are also in or directly adjacent to National Parks and sensitive waterways.

3.4 Railway Assets and Current Operation at Martins Creek

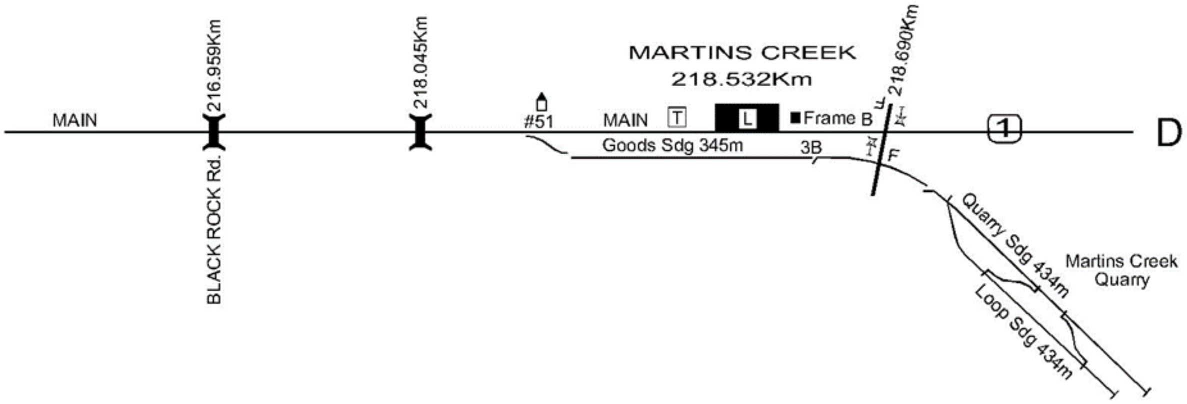

Figure 2 Current yard layout at Martins Creek

The Quarry at Martins Creek is connected to the Main North Coast railway line. The former crossing loop (now goods siding) at Martins Creek provides direct access controlled from the ARTC Control Centre at Broadmeadow. Trains entering the quarry yard have to stop, operate the catchpoints at either end of the Martins Creek Road Level Crossing, activate the flashing lights, and then cross over the road once the lights are operating. The goods siding can hold a train of up to 345 m in length. Longer trains have to be worked straight through into the quarry complex by having a person standing by to manually operate the catchpoints to allow the train to enter the quarry.

The current ARTC ballast trains have a length of 332 m and just fit into the goods siding with a wagon length to spare.

Once in the quarry yard, the train engines run around the train so that they are on the Sydney end of the train. The train is then split for loading. The track beyond the loading bin can accommodate 210 m of wagons which is just over half of the wagons on ARTC's current 24 wagon trains. The train is pushed back underneath the loading bin and wagons are loaded one at a time. Each wagon takes around five minutes to load. The entire loading operation including entering the site, running around, loading the train, splitting and joining the train and preparing to depart the site would take between 2.5 and 3 hours. All shunting is carried out by the train crew.

The railway facilities at Martins Creek Quarry are in reasonable condition suitable for the usage they receive at present. The current facilities do not allow for the operation of modern aggregate or ballast trains because of the shunting time involved in loading and the restricted train length.


Figure 3 Railway loading facility at Martins Creek Quarry

4 Rail Network Access

4.1 Current Rail Network Arrangements in the Hunter Region

Following the adoption of the competition principles in the mid 1990's, the rail network in NSW has been disaggregated with the aim of encouraging above rail competition.

The current rail industry structure in the Hunter Region is as follows:

Table 3 Rail Networks in the Hunter Region

Rail Network	Geographical Extent	Business Focus
ARTC – Hunter Valley	Newcastle coal ports to Gunnedah and Ulan.	Export coal haulage
ARTC – Interstate	Telarah to Brisbane	Supports long distance intermodal interstate freight trains.
Transport for NSW	Woodville Junction (near Broadmeadow) to Sydney	Operation of passenger services primary focus commuter services.
South Maitland Railways	East Maitland	Coal haulage
Other private lines	Various lines such as Saxonvale Branch, Draytons Branch serving mines.	Coal haulage
Newcastle light rail network	TBA	Light rail passenger services

Several different categories of trains operate over the networks managed by ARTC and TfNSW with the passenger services operated by NSW Trainlink using all of the networks and having the highest priority for scheduling over all of the networks. This passenger priority also has significant impact on the scheduling of trains through the Sydney area which has a flow on effect to the operations in the Hunter Region.

4.2 Rail Network Capacity

ARTC has invested a significant amount of money in increasing the capacity of both the Interstate and Hunter Valley networks. Both networks carry significant amounts of rail traffic and are congested particularly around the passenger peaks.

Ballast trains are a low priority rail service and are operated clear of other rail traffic. Revenue aggregate trains have a higher priority.

Table 4 Summary of rail network use at Martins Creek

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of XPT Services	6	6	6	6	6	6	6
Number of Passenger Services	10	10	10	10	10	6	6
Number of Freight Services	11	15	14	15	14	18	12
Total	**27**	**31**	**30**	**31**	**30**	**30**	**24**

The usage of the section is low compared with ARTC's simplified capacity calculation which implies a practical capacity of 72 trains per day in this section (or three trains per hour). However, all of the passenger services (and the majority of freight services) operate in between 04:00 – 20:00, with particular congestion in the morning and afternoon passenger peaks. The availability of ballast train paths is severely restricted during this time as the local passenger services connect with the XPT at Dungog, blocking out over an hour around each XPT service.

The adjacent section between Maitland and Newcastle is far more congested with a regular passenger service as well as the full Hunter Valley coal services. In this section, there is a passenger curfew in operation which limits freight train operation during the passenger peaks. The rail network congestion effectively limits the day time loading at Martins Creek to a single train per day. If the worksite is remote from the quarry and requires daytime unloading, this also limits the throughput for rail ballast to a train every two days.

Based on the current timetable, it would appear that it is possible to load two trains during the period from 20:00 to 05:00 and one during the period 09:00 to 15:00, suggesting that the quarry has a capacity of three trains per day if loading during the evening and night is permitted. A fourth train could be accommodated if the train length was short and the shunting time at Martins Creek reduced by the use of additional ground staff rather than relying on the train crew to shunt the train.

There would appear to be sufficient capacity on the TfNSW and ARTC networks for the operation of additional freight services including ballast and aggregate trains outside the passenger peaks.

5 Market Conditions

5.1 Current Aggregates Market Served by Martins Creek Quarry

Whilst the quarry was historically developed for railway purposes, the quarry operation has only supplied around 10 % of its output by rail for many years.

The remainder of the production travels to disparate sources (mostly asphalt and concrete batching plants) in the Lower Hunter Region, Newcastle, the Central Coast and northern Sydney. There is not an opportunity to stockpile away from the quarry due to the large area required and the need to stockpile each grade of aggregate.

The majority of the output by road travels to the Newcastle, Lake Macquarie, Port Stephens, Singleton, Cessnock, Maitland and Rutherford areas. A significant proportion also travels to the area around Teralba and the area around Carrington but these areas are closer to competing quarries located at Seaham.

5.2 Current Market for Railway Ballast

Based on a simple model which looks at the amount of ballast required to replenish the track following resurfacing and ballast cleaning operations, it would appear that a steady state consumption of around 250,000 tonnes per annum is required for maintenance purposes for the rail network within the historical catchment of Martins Creek Quarry.

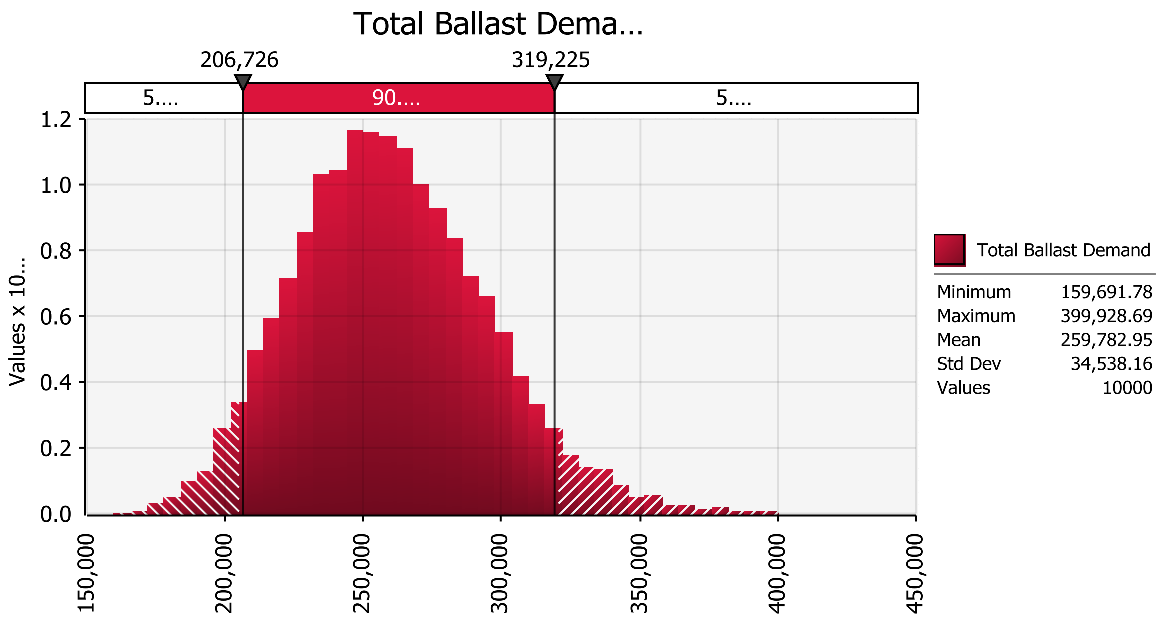

Figure 4 Theoretical annual ballast demand for major track maintenance activities within the area served by Martins Creek Quarry

This is about double the actual quantity of ballast being purchased from Martins Creek quarry by ARTC and TfNSW within this area. There are several reasons for this including the age of the asset with most of the track in the area being rebuilt in the past ten years, recycling of ballast, under investment in maintenance, and failing to supply sufficient new ballast with renewals.

In addition, there will be demand created by new construction projects although the outlook for these in the next five to ten years within the Hunter area is reduced compared with the activity in the recent past.

Constraints to the supply of ballast by rail from Martins Creek include availability of train paths for ballast trains, the availability of suitable wagons to transport and distribute ballast, location of line closures, and timing of line closures.

At ARTC's current charge out rates for ballast wagons, the annual lease cost of a train used by ARTC with the required locomotive power (2 x 2400 kW locomotives) based on long term locomotive hire rates is $2.65 million per annum. The current restriction on loading in the evening and night time at Martins Creek means that this train can only deliver a load of ballast every two days rather than a daily load of ballast. Over a twelve month period this means that about half the ballast which would have been historically loaded onto rail is no longer able to be loaded onto rail and the effective cost per tonne of rail delivered ballast is double what it would have been. This provides a major commercial incentive for the use of road transport and temporary stockpiles for ballast distribution.

The railway quarries have historically provided a 24 / 7 source of emergency materials for the rail network to repair tracks following derailments, floods and landslips. This function is of vital importance in timely restoration of rail services following natural disasters and also removes significant traffic from the road network during these periods. Were the rail distribution of ballast and aggregate unavailable, it would potentially create an added source of community disruption in periods of civil emergency as the road network would have to be used to transport ballast and aggregate required to restore services.

The current rail industry structure does not provide the same emphasis on the use of the railway network to support infrastructure rebuilding following periods of civil emergency that has been the case historically. That said, the rail network is built to a higher flood resistance standard than the road network and the ability to use the network in times of emergency remains an important community resource.

For instance, were NSW to be subjected to a major flooding event such as the 1955 flood, then the rail network may become the main source of supply for a large part of NSW until road rebuilding could occur. This situation could occur again, recently in the aftermath of the 2011 Christchurch earthquake in New Zealand, rail services were restored to the city several days earlier than alternative transport options became available and rail logistics played a major role in keeping the city supplied.

5.3 Potential Train Consists

In assessing the potential for rail haulage of aggregate from Martins Creek, a series of train consists were analysed. These consists conform to the requirements in the current Train Operating Conditions Books published by ARTC and TfNSW. The consists assume that an "L4" type locomotive is used. This type of locomotive is commonly used for aggregate hauls and on ballast trains in NSW. The lease rates for rollingstock have been based on quoted rates from ARTC and a long term rate from a major supplier of leased rollingstock.

Due to the gradients between Hawkesbury River and Cowan, additional motive power is required for trains operating south of the Hawkesbury River.

Table 5 Train consists analysed

Train Consists	No. of Locos	Wagon Type #1	No of Wagons	Wagon Type #2	No of Wagons	Train Length (m)	Train Payload (tonne)	Comments
Ballast Train	2	NDFF	22	NDOF	2	332	1296	Current operation.
Sydney Aggregate Efficient	4	CHAY	49			820	3381	Similar consist to that planned by Holcim for its operations from Lynwood to Rooty Hill.
Sydney Aggregate Small	2	CHAY	24			402	1656	
Sydney Aggregate in Containers	2	CQKY 80t	24			393	1032	
Newcastle Aggregate Efficient	2	CHAY	38			612	2622	
Newcastle Aggregate Small	1	CHAY	19			306	1311	Smaller consist suitable for short hauls
Newcastle side dump wagons	1	NDSF	23			341	966	
Aggregate Containers Newcastle	1	CQKY 80t	22			342	946	

Legend:

(red)	Train requires capital expenditure at Martins Creek to extend the sidings
(green)	Train able to fit into Martins Creek with the current layout

Table 6 Summarises the available throughput of each train consist based on a single cycle on 150, 250 and 300 days a year operation and the consequent impact on fixed costs. Given the high capital cost of the plant involved and rollingstock it would be desirable to operate on a minimum of 300 days per annum (most mineral haulage operation in NSW would be achieving in excess of 330 days per annum operation and at least 2 cycles per day over the short distances involved).

However, operating in this manner means that significantly more throughput is required than that available from the current operation at Martins Creek. This level of throughput is also well in excess of likely market capture given the proximity of competing aggregate sources for general use.

Table 6 Summary of throughput available from train consists

Days Per Annum Operation	150	250	300
Sydney Aggregate Efficient – annual throughput	507,150	845,250	1,014,300
Fixed Cost Component Rollingstock $/t	*$ 7.71*	*$ 4.63*	*$ 3.85*
Sydney Aggregate Small – annual throughput	248,400	414,000	496,800
Fixed Cost Component Rollingstock $/t	*$ 7.82*	*$ 4.69*	*$ 3.91*
Sydney Aggregate in Containers – annual throughput	154,800	258,000	309,600
Fixed Cost Component Rollingstock $/t	*$ 12.55*	*$ 7.53*	*$ 6.27*
Ballast Train – annual throughput	178,200	297,000	356,400
Fixed Cost Component Rollingstock $/t	*$ 14.88*	*$ 8.93*	*$ 7.44*
Newcastle Aggregate Efficient	*393,300*	*655,500*	*786,600*
Fixed Cost Component Rollingstock $/t	*$ 5.83*	*$ 3.50*	*$ 2.92*

Days Per Annum Operation	150	250	300
Newcastle Aggregate Small – annual throughput	196,650	327,750	393,300
Fixed Cost Component Rollingstock $/t	*$ 5.83*	*$ 3.50*	*$ 2.92*
Newcastle side dump wagons – annual throughput	144,900	241,500	289,800
Fixed Cost Component Rollingstock $/t	*$ 13.59*	*$ 8.15*	*$ 6.79*
Aggregate Containers Newcastle – annual throughput	141,900	236,500	283,800
Fixed Cost Component Rollingstock $/t	*$ 7.40*	*$ 4.44*	*$ 3.70*

5.4 Rail Transport of Aggregates

Railways have historically found the aggregates market difficult to compete in because of the fact that aggregate for construction purposes is a relatively common mineral with a consequently low value meaning that it cannot sustain a large haulage cost. A relatively high volume of product is required to be transported on an annual basis to offset the cost of providing the terminal.

Table 7 Quarries in New South Wales with a currently active rail connection

Location	Distance (km) from Sydney by Rail	Distance (km) from Martins Ck by Rail	Use	Comments
Martins Creek	218	0	Railway ballast, commercial aggregate	Former railway quarry now owned by Buttai Gravel Pty Ltd.
Ardglen	363	197	Railway ballast, commercial aggregate	Former railway quarry now also owned by Buttai Gravel Pty Ltd. Historically served network segments.
Bombo	118	337	Railway ballast.	Current railway quarry. On Illawarra line near Kiama. Surrounded by residential development.
Dunmore	110	329	General construction aggregates.	Current railway quarry. On Illawarra line near Shellharbour. Residential development encroaching.
Peppertree	197	391	General construction aggregates.	Newly completed loading facility capable of loading trains of up to 1200 m in length. Quarry owned and operated by Boral. This quarry was developed to supply the Sydney market to replace the exhausted quarries on the Nepean River at Emu Plains. Product railed to a variety of existing receival points owned by Boral in the Sydney metropolitan area.
Lynwood	195	389	General construction aggregates.	Newly completed loading facility capable of loading trains of up to 900 m in length. Quarry owned and operated by Holcim. This quarry was developed to supply the Sydney market to replace the exhausted quarries on the Nepean River at Emu Plains. Product railed to new receival point at Rooty Hill in western Sydney.

There are currently no suitable operating receival terminals for aggregate in the Hunter Region.

The table below summarises the likely development costs of a rail receival location. The most likely locations in the lower Hunter area which could support rail receival of aggregates are in the vicinity of the Port Waratah complex in Carrington and around the Sulphide Junction / Teralba area which connect with existing or former industrial rail lines. Both of these areas have disused industrial lines which could be used to reconnect to at a lower cost than a new connection. On average, these two locations combined would take around 300,000 tonnes per annum of product from Martins Creek. This would represent the largest single point source in the current market served by Martins Creek Quarry.

Table 8 Typical costs of rail receival facilities

Type of Facility	Likely Capital Cost	Average Annual Capital Cost Over Facility Life
Large high production aggregate handling facility suitable for volumes up to 5 M t pa. Assumed life 20 years.	$ 101,857,033	$ 9,464,361.44
Moderate facility on a new rail connection from an existing siding. Assumed life 20 years.	$ 21,298,713	$ 1,979,035.85
Minimalist facility on an existing rail connection requiring no upgrades. Assumed life 10 years.	$ 4,092,546	$ 575,654.45

Whilst rail transport has a clear operating cost advantage over road transport, the capital cost of the rail receival plant and the inability to achieve multiple cycles of a train consist in a 24 hour period (due to rail network congestion) makes rail transport expensive over short distances and small volumes.

The fixed cost associated with the construction of the two rail receival facilities and a train capable of delivering the aggregate to these locations would be around about $2.3 million per annum. The fixed cost component alone is about the same as the road transport cost of delivering aggregate to these locations. This does not include the rail operating costs or the cost of the short road haul from the central rail receival location to the end use location. When these costs are added in, the cost of using rail line haul is around 30 % more expensive than the road haul rate from Martins Creek. In the case of Teralba, there is a competing quarry located in the area and this cost would ensure that the market capture of the Martins Creek product would be minimal.

To compete with road transport over this distance the fixed costs have to be spread over a throughput of in excess of 1 million tonnes per annum or around four times the current production level being sold into this market. This assumes that train paths are available to achieve this and would require a total cycle time of under five hours. It would also require a reduction in loading time at Martins Creek which would incur additional capital cost.

The use of wagon types such as side dump wagons or loading aggregates into containers would reduce the plant fixed cost. The side dump wagons are expensive to operate and create product wastage as well as potential dust generation in handling and reloading the product onto trucks for final distribution. The containers require a container terminal to load and reload the product.

The use of rail transport for the Sydney Market NSW is based on significant volumes which support the investment in a high productivity terminal. The recently completed Holcim terminal at Rooty Hill has, according to the Environmental Assessment (Holcim (2010)), an initial volume of 2 million tonnes per annum rising to 4 million tonnes per annum. The throughput is delivered in trains of between 42 and 50 wagons carrying between 3150 and 3750 t each and are up to 805 m in length. This throughput supports the capital investment of $100 million in this facility.

6 Conclusions and Recommendations

6.1 Conclusions

The Martins Creek Quarry is the only operating rail served quarry within the Hunter Valley and northern areas of the greater Sydney Region. It fulfils a vital function in the ongoing provision of rail services. There are far fewer sources of aggregate suitable for use as ballast in heavy haul and passenger rail networks than sources of aggregates for the general construction market and the resource at Martins Creek has a proven provenance for use on the rail network.

The current limitation on loading at the quarry in the evening and at night time is restricting its ability to compete in the delivery of ballast by rail. This has both a negative commercial impact as well as environmental impacts on the wider community.

However, if the quarry were to be restricted in operations to supplying railway only ballast it would become economically unviable as the current output for railway purposes is only around 10% of its total production and the potential market size is only about double the current production.

The ability of the quarry to increase rail distribution of aggregates within its current distribution area is limited by the lack of suitable rail unloading facilities, large number of product destinations, short haulage distances and a large number of competing quarries which are supplied by road serving the same markets with logistic chains.

6.2 Recommendations

In order to encourage the ongoing use of Martins Creek quarry by rail networks to supply ballast to the rail network, it is recommended that the practice of evening and night time train loading be reinstated which should enable the productivity of rail ballast distribution to double.

To maintain the competitive position of the facility and enable future expansion of markets, consideration should be given to extending the sidings to allow for the operation of longer trains.

7 References

7.1 Reference Listing

ARTC, *Network Access Seeker Information,* http://www.artc.com.au, viewed December 2014.
ARTC, Master Train Plan effective 22 February 2015*,* http://www.artc.com.au, viewed January 2015.

Holcim (2010), Proposed Minor Modification to Holcim Rooty Hill Distribution Centre Environmental Assessment http://www.holcim.com.au/uploads/AU/RootyHillEAS-MainText.pdf viewed December 2014