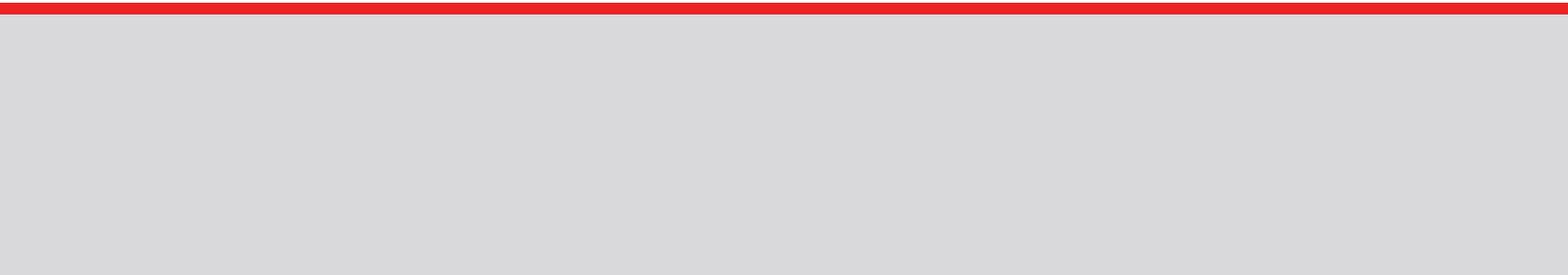


Jandra Quarry

Intensification in Production
Environmental Assessment
July 2014







Jandra Quarry Intensification Project

Environmental Assessment

Prepared for Holcim (Australia) Pty Limited

22 July 2014

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Jandra Quarry Intensification Project

Environmental Assessment

FINAL

Report # 2 | Prepared for Holcim (Australia) Pty Limited | 22 July 2014

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Date	22 July 2014	Date	22 July 2014

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EXECUTIVE SUMMARY

Introduction

Holcim (Australia) Pty Ltd (Holcim) is seeking to modify the Jandra Quarry development consent (DA231-10-99) under Section 75W of the *Environmental Planning and Assessment Act 1979*, to provide for an increase in production and transportation of finished quarry products to a maximum annual limit of 475,000 tonnes (the proposal).

Jandra Quarry is a hard rock quarry located on the Pacific Highway at Possum Brush approximately 17 kilometres south of Taree in the Greater Taree Local Government Area.

Element Environment Pty Ltd (Element) has prepared this Environmental Assessment (EA) on behalf of Holcim to assess the potential environmental and social impacts of the proposed modifications associated with the intensification in production.

Justification for the Proposed Modification

An increase in production is required at Jandra Quarry to meet market demand. In the fourth quarter of 2013, Holcim turned down a significant amount of work as a direct result of the restrictions on operations provided in the existing development consent.

With Pacific Highway upgrade work around Port Macquarie predicted to peak in 2015 combined with other major infrastructure projects related to coal and gas development predicted over the next five years, Holcim has forecast peak annual demand to exceed 400,000 tonnes, reaching as much as 475,000 tonnes in coming years.

Description of the Proposed Modification

The proposed intensification in production requires changes to the approved operations. Those changes that have the potential to result in additional environmental impacts include:

- Extension of operating hours to include weekday evenings (6:00 am to 10:00 pm Monday to Friday) and from 6:00 am to 6:00 pm Saturday, including the return of trucks from Newcastle haul to midnight. Refuelling, servicing and maintenance will also be extended from 9:00 pm to 10:00 pm on Saturdays;
- Asphalt production on a 24 hour campaign basis;
- Addition of a mobile crusher within the quarry pit to increase processing capacity;
- Increasing blasting frequency from approximately one blast per month to approximately two blasts per month;
- Increase in total vehicle movements;
- Construction of a new heavy vehicle access road, requiring clearing of 0.25 hectares of native vegetation, to separate inbound heavy vehicles from outbound heavy and light vehicles; and
- Expansion of the finished product stockpile area, requiring clearing of 1.034 hectares of native vegetation.

The approved extraction area, as detailed in the 1999 EIS, has a depth limit of RL20 and (at the time) contained 16.5 million tonnes (Mt) of fresh rock. To date, Holcim has extracted and processed in the order of 3 Mt of this resource.

The proposed modification is being sought to extract, produce and transport a maximum of 475,000 tonnes of hard rock per calendar year, with an approval period of 30 years. It is not proposed to

increase extraction of the overall resource and therefore no modification to the approved quarry pit disturbance area or depth is proposed or considered necessary.

Impact Assessment

Specialist technical investigations were undertaken to assess key environmental issues associated with the proposed intensification in production that were identified by the project team and a thorough government agency and community consultation process. For those environmental issues identified as low risk, further specialist technical investigations are not required, as the proposed modification will not result in any additional impacts on these low risk environmental issues than that already assessed in the 1999 EIS and subsequent approved modifications.

The potential environmental impacts of the proposed modification have been identified and thoroughly assessed in this Environmental Assessment. A broad overview of the key outcomes of the environmental and social impact assessment for the proposed modification are outlined in the following pages.

Traffic and Transport

Although the proposed modification will result in an increase in the total number of vehicle movements per day, the number of vehicle movements in a maximum hour is unlikely to change. The traffic impact assessment concluded that the current Pacific Highway - Jandra Quarry Access Road intersection has sufficient capacity, is suitably configured and does not require upgrading, in order to safely accommodate the proposed modification.

Noise and Blasting

The noise and blasting impact assessment considered the potential impacts of the proposed modification on nearby sensitive residential receivers.

Noise levels (without asphalt production) below the early morning shoulder project criteria, are predicted at all private residential receiver locations and for all stages of the quarry life, provided that operations are restricted during this time including:

- No works in the approved overburden emplacement area;
- No works above RL50; and
- No operation of the mobile processing plant.

Noise levels (without asphalt production) above the day / evening criteria are predicted at three private residential receivers and range from a marginal 2 dBA to 5 dBA above the criteria. Holcim is confident that these noise levels will not be perceived as a nuisance and will negotiate agreements with the potentially affected property owners.

Noise levels from asphalt production are up to 7 dBA above the criteria at one private residential receiver R1 during all periods and all stages of the quarry development, as this receiver has a line of sight to the asphalt plant. Holcim will pursue a negotiated agreement with the property holder of R1. If an agreement cannot be negotiated with R1, compliance with the criteria could be achieved by constructing a noise barrier immediately east of the asphalt plant. The extent, height and location of the barrier can be determined during detailed noise control design process.

The future change in road traffic noise levels associated with the proposed modification is predicated to be below the threshold criteria of +2 dBA and therefore no further investigations or controls are considered necessary.

Noise levels are predicted to be below the project sleep disturbance criteria at all identified residential receiver locations provided operational restrictions during the early morning shoulder periods are implemented.

To control ground borne vibration and airblast to privately owned receivers, the MIC for blasts would not exceed the calculated MICs outlined in Table 15 (this will ensure that the blasting criteria will be met at the nearest receiver at all blasting locations). The MIC used on the northern benches during Stage 3 would be restricted to no greater than 125 kg in order to meet the blasting criteria at the nearest receiver R1.

Blasts would continue to be monitored at the closest private residence (in accordance with condition 45 of DA231-10-99 and the requirements of EPL 2796) in order to establish compliance with the blasting criteria.

The levels of noise emitted from the quarry operations would continue to be monitored at the closest private residence (in accordance with the condition 44 of DA231-10-99 and the requirements of EPL 2796) in order to establish compliance with the noise criteria.

Air Quality

The air quality impact assessment considered the potential impacts of the proposed modification on nearby sensitive residential receivers.

The air quality impact assessment concluded that with the implementation of existing and additional feasible management measures, all relevant air quality criteria could be met at all identified sensitive residential receivers for all stages of the quarry development.

The odour concentration modelling results identified that the proposed new mobile asphalt plant that would be operated on a campaign basis, is unlikely to cause any odour nuisance at any surrounding sensitive receivers.

Surface Water Management

The proposed intensification in production will increase the demand for process water. A surface water management assessment was undertaken to review the existing stormwater management system at Jandra Quarry and its capacity to meet future process water demands and attenuate stormwater runoff and sediment.

The assessment concluded that the site storage is capable of satisfying the quarry's current water demands. During all stages of the quarry development, water shortages may occur in extreme dry conditions (5th percentile year) for up to a month if maximum production and water use is maintained. However, up to 5 ML per annum can be extracted from the clean water dam under the Part 2 license granted as part of the existing development consent for Jandra Quarry. This back up water source may be relied upon in the event of extended drought conditions and provides sufficient water to meet the expected deficit in non-potable water required. Increasing the pit dam storage can also improve stormwater harvesting yields during dry periods. This is a feasible option for improving stormwater storage as the pit dam will need to be re-established during each stage of the quarry development as the depth and size of the quarry pit changes.

The surface water management assessment considered the relevant provisions of the Water Act and Water Management Act as they relate to controlled activity approvals and water extraction license requirements. The assessment concluded that the proposed modification would not require further approvals or licences under these respective Acts as long as the extraction of water from the clean water dam does not exceed the existing license threshold of 5 ML per annum.

With the implementation of surface water management measures included in the Soil and Water Management Plan, the EPL and this EA, the proposed modification would not result in any significant impacts on the downstream environments.

Flora and Fauna

The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area will be located on land that falls outside of the approved disturbance area. Construction of this

new infrastructure will involve the clearing of a total of 1.284 hectares of native vegetation and ground disturbance.

The proposed intensification in production would also expose fauna that inhabit the bushland that surrounds the Jandra Quarry, to longer periods of noise and lighting and increased risk of road-kill.

The flora and fauna impact assessment, which included two targeted surveys for threatened flora as well as a Koala survey, drew the following conclusions:

- The proposed modification will not impact on:
 - Endangered Ecological Communities; or
 - Threatened fauna species;
- The proposed modification will not result in a significant impact on threatened flora. However the Eastern Underground Orchid could not be surveyed as it is an underground species that can only be detected when it flowers in spring. The Eastern Underground Orchid is currently known from fewer than 10 locations, but has been recorded less than 40 km away in the Bulahdelah area and given the potentially suitable habitat on site, it has the potential to be present. If present, any impact could be considered to be significant based on the few known locations for the species and therefore very small population size.

OEH advised in a phone conversation on 26th of June 2014 that a (Section 5A) seven part test and EPBC Assessment should be undertaken for the Eastern Underground Orchid with it being presumed to be present in the proposed disturbance area. These assessments concluded that there is likely to be a significant impact on the Eastern Underground Orchid if it was found to be present.

It is therefore recommended that a targeted survey is undertaken for this species between September and November, in order to establish if the Eastern Underground Orchid is present in the proposed disturbance area. Should this species be detected, then Holcim would liaise with the relevant authorities regarding mitigation and management of impacts;

- The study area contains Koala feed trees at a suitable density to be potential core Koala habitat. However the lack of records from previous surveys, the paucity of database records within 20km of the study area, and the failure to locate any individuals or definite signs of Koala presence during the site survey, all indicate that there is not a breeding population of the Koala present within the study area. Consequently, the study area does not contain core Koala habitat, there is no evidence of koala breeding activity or any form of resident population and therefore this species does not require further consideration or assessment;
- The proposed new disturbance area contains seven hollow-bearing trees that would be removed. The impacts of the removal of hollow-bearing trees are proposed to be mitigated through the inclusion of nesting boxes, at a ratio of 2:1 for every hollow removed; and
- There is unlikely to be any significant increase in fauna road-kills. The increase in fauna exposure to operational noise, light and dust is not considered significant.

With the implementation of flora and fauna management measures included in the Flora and Fauna Management Plan and this EA, (depending on the outcome of the targeted surveys for the Eastern Underground Orchid) the proposed modification would not result in any significant impacts on biodiversity on site and in surrounding bushland.

Heritage

The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area will be located on land that falls outside of the approved disturbance area.

The Aboriginal heritage due diligence assessment concluded that no Aboriginal or historic heritage objects / sites are located within the new disturbance area and therefore the proposed modification would not result in any heritage impacts.

Aboriginal heritage sites within the development consent boundary will continue to be managed in accordance with the Aboriginal Heritage Impact Permit, and the Jandra Quarry Environmental Management Plan.

Greenhouse Gases

A GHG emissions assessment was undertaken to quantify the increase in GHG emitted as a result of the proposed modification and to identify actions for mitigating or reducing emissions, where possible.

The GHG emissions assessment concluded that although the proposed intensification in production will increase annual GHG emissions, the extractive resource is being extracted in a shorter time period and therefore the total emissions associated with the production and transportation of quarry products, will not increase over the life of the quarry.

Possible GHG management actions have been recommended to reduce annual GHG emissions from the quarry operations.

Socio Economic

The Jandra Quarry has been operating since 1986 without significant adverse impact on surrounding land uses or the socio-economic environment. With the exception of odour from the previous old asphalt plant (since decommissioned), there are no recorded complaints from neighbouring landowners. Holcim maintains a positive relationship with all Jandra Quarry neighbours and the Quarry Manager has an open door policy, welcoming any feedback on the quarry operations.

The potential social impacts of the proposed modification relate largely to impacts on general amenity such as noise and blasting, air quality (dust), surface water runoff and traffic. These potential social impacts have been thoroughly assessed in the EA and a range of mitigation measures (in addition to those presented in the 1999 EIS and Jandra Quarry Environmental Management Plan) are recommended to minimise potential noise, air quality and surface water impacts so they are not perceived as a nuisance to neighbouring residents.

The proposed modification has the potential to result in positive economic benefits to the local area including:

- Uninterrupted supply of essential construction materials to local and regional development projects at cost-effective prices;
- Employment of an additional three full time employees and three truck/transportation drivers, with further jobs created through flow-on effects;
- Contribution to the economy of \$186,290 in direct and indirect benefits from construction works and \$1,751,420 in ongoing operational costs;
- Optimal use of a regionally-significant resource; and
- Economic benefits to the local community through the purchase of goods and services and local expenditure both directly and indirectly through employee wages.

The proposed modification offers a net economic benefit to the NSW economy.

Flooding and Groundwater

The Jandra Quarry site and the areas affected by the proposed modification, do not fall within flood prone land and are therefore unlikely to be impacted by flood events.

The existing quarry is not subject to groundwater inflow. No groundwater was recorded by the geological investigations undertaken for the 1999 EIS.

Relatively shallow earthworks excavations, required for the construction of the proposed new heavy vehicle access road and expansion of the existing finished product stockpile area, are therefore unlikely to impact on groundwater.

The proposed modification will not result in any changes to the approved quarry pit in terms of both depth and disturbance area.

Further consideration of flooding and groundwater is therefore not considered necessary in assessment of the potential environmental impacts associated with the proposed modification.

Land Contamination

Potential to encounter or disturb areas of contamination are low with historical land uses (prior to the commencement of quarrying operations) being forested bushland surrounded by agriculture. Holcim are also unaware of any potential contaminating activities that have been undertaken within the proposed new ground disturbance area.

An EPA Contaminated Land Record search was undertaken in February 2014 and no sites were recorded within the Greater Taree LGA.

Six separate site surveys were undertaken during the EA process, of the proposed new disturbance area (aboriginal heritage survey, two flora and fauna surveys and three general site visits) and no evidence of contamination or potentially contaminating activities were identified. In the event that previously unidentified contaminated land is located during construction, relevant statutory requirements would need to be complied with. No further assessment of contaminated land or land remediation is considered necessary.

Visual Amenity

A visual impact assessment was undertaken as part of the 1999 EIS. The potential visual impacts of the quarry that were identified included:

- Minor impacts on existing residential properties;
- An increase in the exposure of the quarry face when viewed from vehicles travelling in a southerly direction along the Pacific Highway. The time of exposure along the Pacific Highway was determined to be limited; and
- Negligible impact from the Taree lookout facility and Fire Tower.

The construction of the new heavy vehicle access road and expansion of the finished product stockpile area are the only proposed changes to the approved disturbance area. This proposed new infrastructure will be located immediately adjacent to the approved site facilities area and will be screened from all surrounding residential properties by existing vegetation and topography.

The proposed modification will not result in any significant changes to the visual impacts predicted in the 1999 EIS. No further assessment of potential impacts on the visual amenity is therefore considered necessary.

Holcim will continue to manage visual impacts in accordance with the existing Landscape and Rehabilitation Plan.

Rehabilitation and Closure

A Landscape and Rehabilitation Plan was prepared for the site as part of the 1999 EIS. Progressive implementation of the Landscape and Rehabilitation Plan will produce a stable landform, which is compatible with the surrounding area.

With the proposed intensification in production, the quarry is expected to have a minimum lifespan of approximately 29 years. However it is not proposed to increase extraction of the overall resource. Therefore no additional extraction areas, outside the approved quarry pit disturbance area, need to be considered as part of the approved rehabilitation and closure strategy.

The proposed heavy vehicle access road and expansion of the finished product stockpile area will form part of the site facilities area and will be rehabilitated with the rest of the approved quarry operational areas in accordance with the Landscape and Rehabilitation Plan outlined in the 1999 EIS and included in the Jandra Quarry Environmental Management Plan.

As was the case when preparing the Landscape and Rehabilitation Plan for the quarry in the 1999 EIS, it is impossible to predict accurately the likely future land use at the site, given the substantial changes expected to occur in the region over the next 30 years. Future land use will need to consider the applicable planning policy framework as well as the surrounding land use and environmental and market conditions at the time.

Conclusion

As outlined in this Environmental Assessment, the proposed modification is unlikely to result in any significant impacts on either the biophysical or social environment with the implementation of:

- Environmental management and mitigation measures as outlined in:
 - The Jandra Quarry Environmental Management Plan;
 - This EA report;
- Requirements of the EPL; and
- Conditions of development consent (DA231-10-99).

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Plate 3: View of the southern quarry face showing the rehabilitated RL 98 top bench.

Plate 4: The pit dam.

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Plate 6: View south of the finished product stockpile area, processing plant and southern quarry face.

Plate 7: View from the main dam along the proposed alignment of the new heavy vehicle access road.

Plate 8: Typical vegetation cover along the proposed new heavy vehicle access road alignment.

APPENDICES

Appendix A: Consultation

Appendix B: Traffic Impact Assessment

Appendix C: Noise and Blasting Impact Assessment

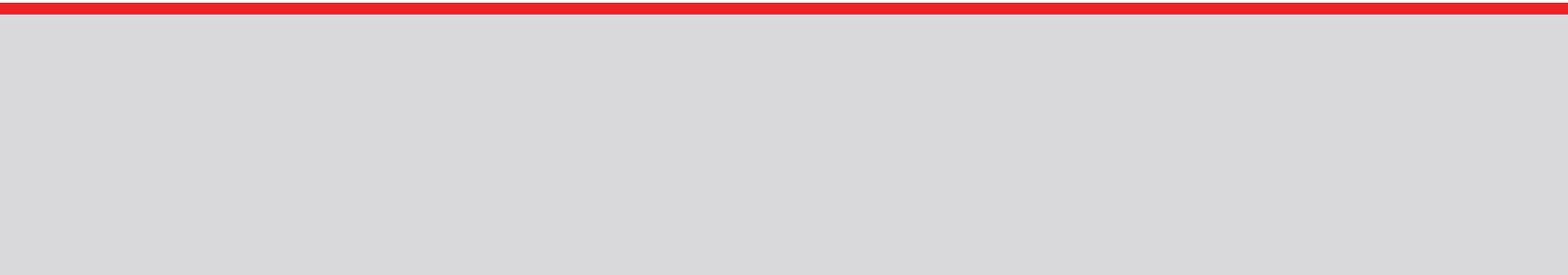
Appendix D: Air Quality Impact Assessment

Appendix E: Surface Water Management Assessment

Appendix F: Flora and Fauna Impact Assessment

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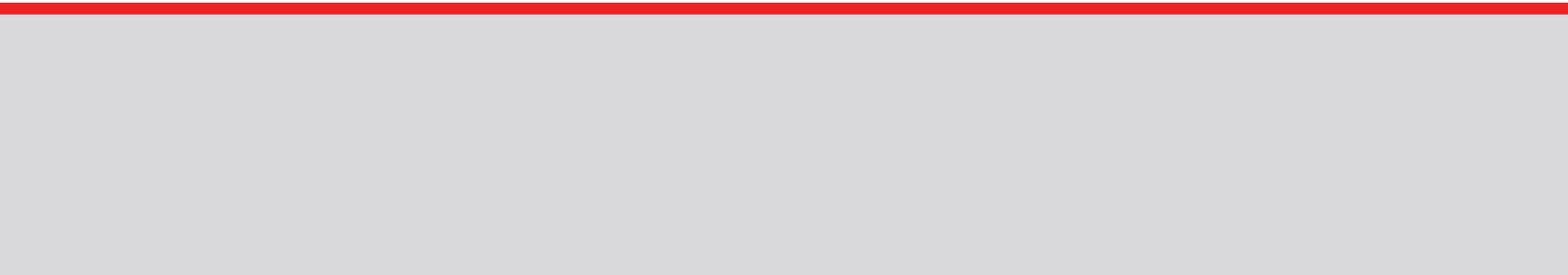
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Section I

INTRODUCTION





1 INTRODUCTION

Holcim (Australia) Pty Ltd (Holcim) is seeking to modify the Jandra Quarry development consent (DA231-10-99) under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to provide for an increase in production and transportation of finished quarry products to a maximum annual limit of 475,000 tonnes (the proposal).

Jandra Quarry is a hard rock quarry located approximately 17 kilometres south of Taree in the Greater Taree Local Government Area (LGA) (refer to Figure 1).

Element Environment Pty Ltd has prepared this Environmental Assessment (EA) on behalf of Holcim to assess the potential environmental and social impacts of the proposed modifications associated with the intensification in production.

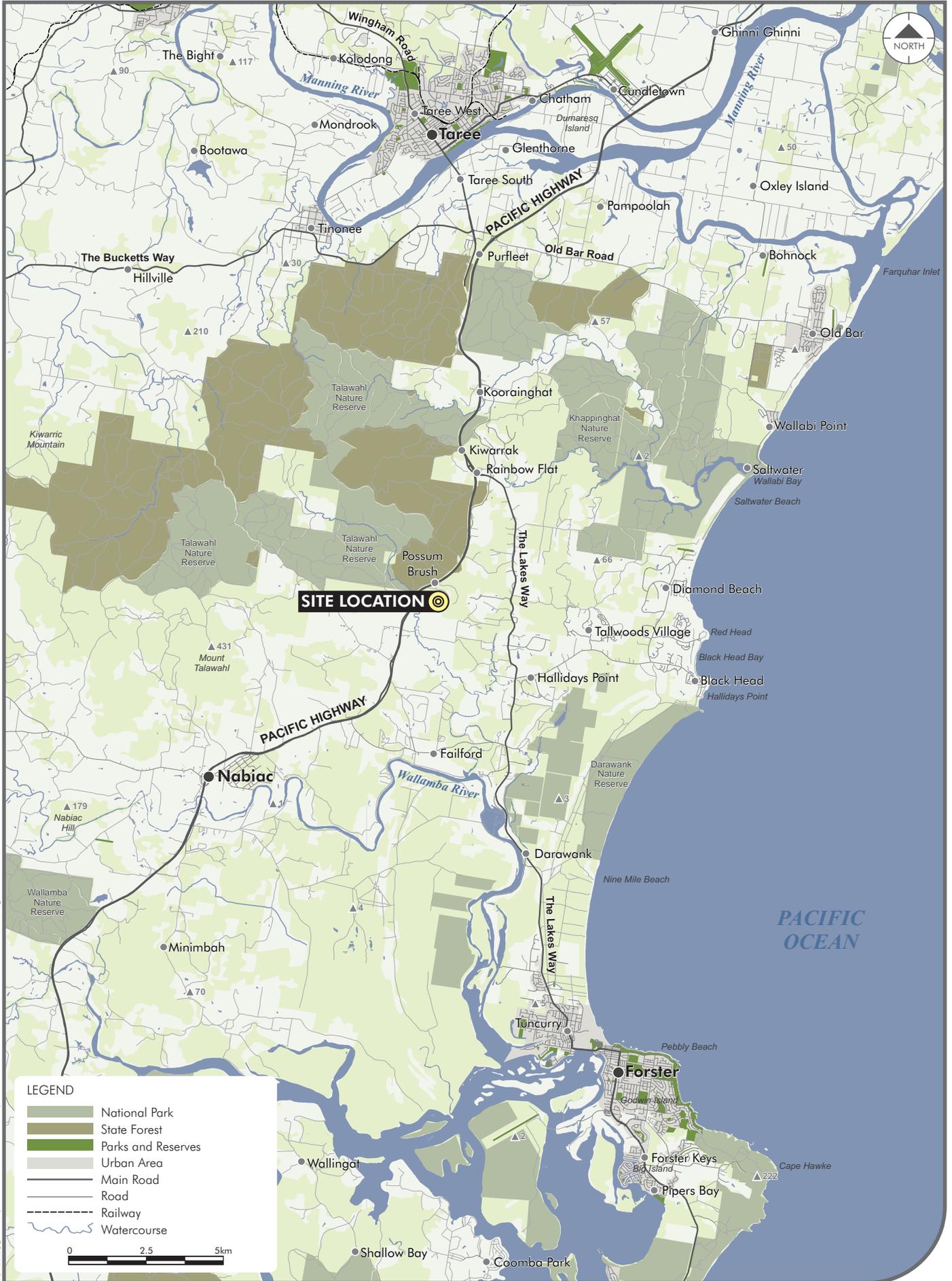
1.1 The Applicant

The applicant for the proposed modification is Holcim.

Holcim is one of the country's leading producers and suppliers of construction materials such as concrete and quarry products. In Australia, Holcim has a network of over 200 concrete plants, 900 mixer trucks and 88 quarry operations, which provide high quality concrete and quarry products to a diverse range of customers. Quarry products include rail ballast, aggregates, gravels, road pavement materials, manufactured and natural sands.

1.2 Approval Process

Holcim is seeking to modify the Jandra Quarry development consent, DA231-10-99 pursuant to Section 75W of the EP&A Act. The Minister for Planning and Infrastructure is the consent authority for the proposed modification.



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Section 2

EXISTING ENVIRONMENT AND QUARRY
OPERATIONS





2 EXISTING ENVIRONMENT AND QUARRY OPERATIONS

2.1 Planning Approval History

Jandra Quarry has been the subject of various development consents and subsequent modifications, which are outlined in Table 1.

Table 1: Planning Approval History

Date of Development Consent	DA/MOD Number	Details
2/06/1986	DA10512/1985	Extract and process 50,000 tonnes of hard rock within an area of approximately 5 hectares.
28/02/1992	DA91/391	Increase in production at the quarry from 50,000 tonnes to 150,000 tonnes per annum.
30/03/2000	DA231-10-99	Provided for an average production and transportation limit of 250,000 tonnes of finished quarry products per annum (refer to Table 3 for further detail on development consent parameters). DA10512/1985 and DA91/391 were surrendered.
11/12/2002	MOD-199-6-2002	Removal of an additional 2.2 hectares of vegetation to allow the enlargement of the existing overburden emplacement area from 0.9 hectares to 3.1 hectares.
6/12/2007	DA231-10-99 MOD 3	To provide for air quality and noise monitoring to be undertaken on a three yearly basis.
24/04/2012	DA231-10-99 MOD 4	Amended Schedule 2, condition 5 of the development consent to read <i>“The production and transportation of finished quarry products is limited up to a maximum of 250,000 tonnes per calendar year.”</i>

2.1.1 Environment Protection Licence

Holcim holds an Environment Protection Licence (EPL) – EPL 2796 for the quarry operations. EPL 2796 provides water discharge and blast monitoring criteria along with requirements for annual reporting.

2.2 Land Ownership

All land located within the development consent boundary is owned by Holcim (refer to Figure 3). Holcim also owns Lot 10, DP790056, which is located immediately south of the development consent boundary. The remaining surrounding land is primarily privately owned, with a State Forest located to the northwest of the quarry on the opposite side of the Pacific Highway. All properties under Holcim ownership are presented in Table 2.

Table 2: Holcim Land Ownership

Lot	DP
2	255621
10	790056
11	790056
12	790056
13	790056
14	790056
15	790056

2.3 Existing Environment

Jandra Quarry is located on the Pacific Highway at Possum Brush, NSW. The Pacific Highway provides access to the site. The closest village to the site is Nabiac, located approximately 10 kilometres to the southwest of the site (refer to Figure 1).

The land immediately surrounding Jandra Quarry is well vegetated. The site is bound by privately owned land to the south, north and east (refer to Figure 4). Residences are located to the northeast (approximately 350 metres), east (approximately 850 metres), southeast (approximately 1.45 kilometres) and southwest (approximately 800 metres) of the operational areas of the site. The surrounding land is characterised by cleared agricultural land on the lower slopes and moderate to heavily vegetated land on the steeper areas. The lower slopes to the south and east of the site have been extensively cleared and are predominately used for cattle grazing.

The topography of the site and surrounding area is generally undulating with rolling hills and valleys. The existing quarry is cut into the northern face of the hillside and extends from the ridgeline in an easterly direction (refer to Figures 2 and 5). The upper section of the existing working face is visible from the north, however, the remainder of the quarry facilities are not visible from surrounding areas.

The site is located within the headwaters of Talawahl Creek. Talawahl Creek joins with Bungwahl Creek, which subsequently joins the Wallamba River, approximately 5.5 kilometres to the south of the site (refer to Figures 1 and 4).

The area is underlain by an undifferentiated sequence of Devonian sediments that are approximately 345 to 395 million years old. The sequence consists of interbedded mudstone, sandstone, conglomerate, tuff and chert with local greywacke beds. A major greywacke bed is present within the site and is the target of the quarry operations.



ENVIRONMENTAL HERITAGE
 Projects\100171 Jandra Quarry\FIGURES\EA\100171_F2 Approved Quarry Operations_27.06.2014.TD



ENVIRONMENT HERITAGE
 \Projects\100171 Jandra Quarry\FIGURES\EA\100171 F3 Land Ownership_05_06_2014.T0



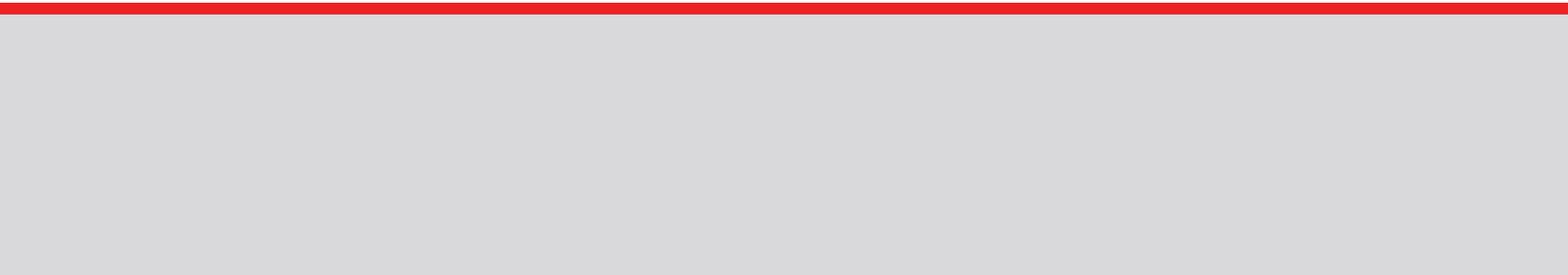
Source: Holcim (2011), Umwelt (2012)

LAND OWNERSHIP
 Environmental Assessment
 Jandra Quarry
 Possum Brush, New South Wales 2430

FIGURE 3

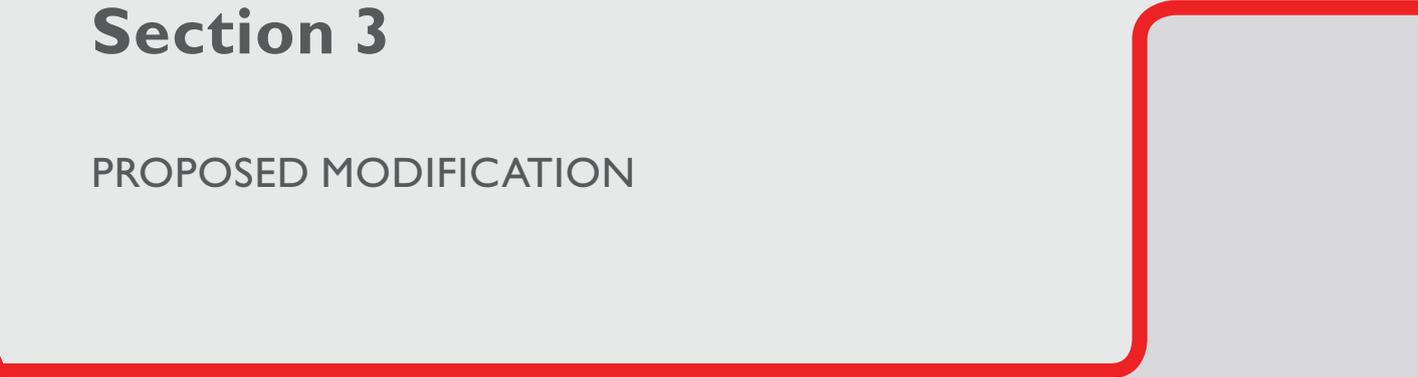


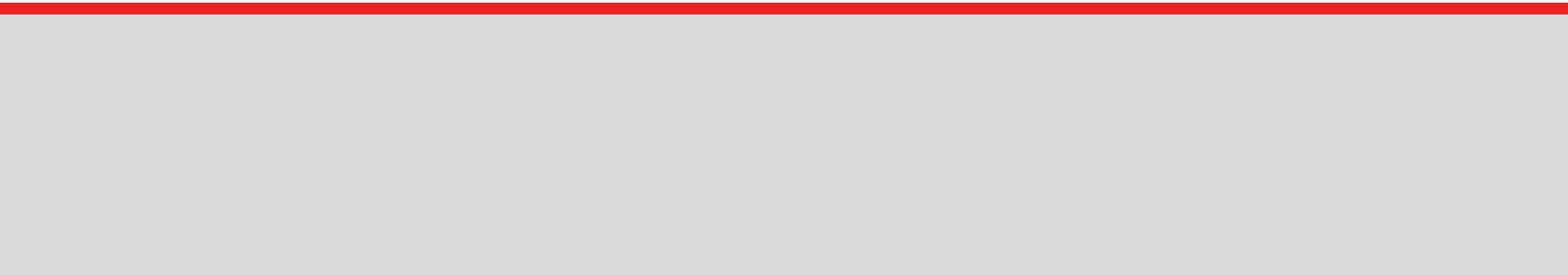
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 Projects\100171 Jandra Quarry\FIGURES\EA\100171 F4 Surrounding Land Use 13 06 2014.TIF



Section 3

PROPOSED MODIFICATION





3 PROPOSED MODIFICATION

3.1 Justification for the Proposed Modification

An increase in production is required at Jandra Quarry to meet market demand. In the fourth quarter of 2013, Holcim turned down a significant amount of work as a direct result of the restrictions on operations provided in the existing development consent. With average monthly sales volumes of approximately 23,500 in the first nine months of 2013, Holcim would have reached an annual production volume of at least 282,000 tonnes if not restricted by the existing development consent.

With Pacific Highway upgrade work around Port Macquarie predicted to peak in 2015 combined with other major infrastructure projects related to coal and gas development predicted over the next five years, Holcim has forecast peak annual demand to exceed 400,000 tonnes, reaching as much as 475,000 tonnes in coming years. These forecast demand figures for 2015 are likely to include the following approximate volumes of finished quarry products:

- 120,000 tonnes for the Oxley Highway to Kundabung – Pacific Highway Upgrade Project. It is estimated that this project will require in excess of 1 million tonnes of finished quarry products, which cannot be supplied by quarries in the immediate vicinity;
- 110,000 tonnes for the Kundabung to Kempsey – Pacific Highway Upgrade Project. It is estimated that this project will require in excess of 700,000 tonnes of finished quarry products, which cannot be supplied by quarries in the immediate vicinity;
- 150,000 tonnes for Holcim concrete batching plants; and
- 80,000 to 100,000 tonnes for work in the local Councils including subdivisions and road upgrades as well as ex bin sales.

Holcim operations provide substantial economic benefits at Federal, State and local levels whilst being committed to maintaining a good working relationship with the community and implementing best practice environmental management across all sites.

The intensification in operations at Jandra Quarry will provide the following key benefits:

- Uninterrupted supply of essential construction materials to local and regional development projects at cost-effective prices;
- Employment of an additional three full time employees and three truck/transportation drivers, with further jobs created through flow-on effects;
- Contribution to the economy of \$186,290 in direct and indirect benefits from construction works and \$1,751,420 in ongoing operational costs;
- Optimal use of a regionally-significant resource; and
- Economic benefits to the local community through the purchase of goods and services and local expenditure both directly and indirectly through employee wages.

Holcim has demonstrated its commitment to effective environmental management in its existing operations. This management approach will continue under the proposed modification.

3.2 Description of the Proposed Modification

Schedule 2, condition 5 of DA231-10-99 as modified on 24 April 2012 (DA231-10-99 MOD 4) provides for the following:

'The production and transportation of finished quarry products is limited up to a maximum of 250,000 tonnes per calendar year'.

As outlined in Section 3.1, Holcim need to increase the production and transportation of finished quarry products from their Jandra Quarry in order to meet current and forecast market demands.

Holcim is therefore seeking to modify the Jandra Quarry development consent (DA231-10-99) to provide for the intensification of quarry operations and allow for the production and transportation of 475,000 tonnes of finished quarry products per calendar year.

To support this proposed intensification in production, certain changes will be required to the existing operations as presented in Table 3.

Table 3: Proposed Modification Parameters

Project Component	Approved Operations	Proposed Modifications
Production and transportation limit	250,000 tonnes per calendar year	475,000 tonnes per calendar year
Consent duration	30 March 2025	30 years from modification approval i.e. 2044
Operating hours	Quarry operations: 6am - 6pm Monday to Friday	Quarry operations: 6am - 10pm Monday to Friday
	Quarry operations: 6am - 3pm Saturday	Quarry operations: 6am - 6pm Saturday
	Refuelling, servicing and maintenance approved from 6am - 9pm Monday to Saturday	Refuelling, servicing and maintenance from 6am - 10pm Monday to Saturday
	Mobile asphalt plant	Operate a mobile asphalt plant (including associated truck movements) on a campaign basis (24 hours a day, 7 days a week) primarily to cater for night road works
		Allow for the return of trucks from Newcastle haul to midnight
Blasting hours	9am - 5pm Monday to Friday	No change
	9am - 3pm Saturday	No change
Quarrying methods	Drill & blast	No change
	Load & haul	No change
Processing methods	Primary, secondary crushing and screening plants (capacity limited to 350, 000 tpa)	Introduction of a mobile crusher to increase processing capacity to 475,000 tpa
	Mobile pugmill	No change
	Mobile asphalt plant	Operate a mobile asphalt plant on a campaign basis (24 hours a day, 7 days a

Project Component	Approved Operations	Proposed Modifications
		week) primarily to cater for night road works
		Allow for concrete recycling
Maximum daily vehicle movements	100 movements per day (50 loads)	Allow for up to 12 trucks or 24 truck movements per peak hour
Infrastructure	Workshop	No change
	Fuel Shed and maintenance area	No change
	Lunch room	No change
	Office	No change
	Training room (not built yet)	A 2nd training room
	Ablutions (toilets and showers)	No change
	Envirocycle sewage treatment system	No change
		Construction of a new heavy vehicle access road (detailed in Section 3.2.1)
	Expansion of the existing finished product stockpile area (detailed in Section 3.2.2)	
Overburden storage	3.1 hectare overburden emplacement area.	No change
Quarry development	Benching approved to RL20	No change to approved extraction area or to depth of extraction
Staff	7 full time employees	10 full time employees
	7 truck drivers	10 truck drivers

The existing approved quarry pit design, as detailed in the 1999 EIS, has a depth limit of RL20 and (at the time) contained 16.5 million tonnes (Mt) of fresh rock. To date, Holcim has extracted and processed in the order of 3Mt of this resource.

The proposed modification is being sought to extract and produce a maximum of 475,000 tonnes per annum, with an approval period of 30 years. It is not proposed to increase extraction of the overall resource and therefore no modification to the approved quarry pit disturbance area or depth is proposed or considered necessary.

However, minor modifications are proposed to the approved site facilities to support the proposed intensification in production as detailed in the following sections.

3.2.1 Heavy Vehicle Access Road

To improve vehicle safety on site, Holcim propose to separate inbound heavy vehicles from outbound heavy and light vehicles after passing through the weighbridge. A new heavy vehicle access road is proposed around the outside (northern and eastern side) of the existing Main Dam (stormwater basin) (refer to Figure 5). After passing through the weighbridge, inbound heavy vehicles will keep left, using the new road to gain direct access to the finished product stockpile area for loading. Outbound loaded heavy vehicles will then use the existing access road to pass through the wheelwash and weighbridge before exiting the site onto the Pacific Highway. Construction of the new heavy vehicle access road will

require the clearing of approximately 0.25 hectares of native vegetation that falls outside of the approved site facilities area disturbance footprint.

3.2.2 Finished Product Stockpile Area

Holcim have also identified the requirement to expand the size of the existing finished product stockpile area towards the existing overburden emplacement area (refer to Figure 5 and Plate 1). The existing finished product stockpile area does not have sufficient capacity to cater for the intensification in production. The most logical approach to increasing the capacity to store additional finished product is to construct an elevated bench on the moderate west facing slope that lies between the existing finished product stockpile area and the overburden emplacement area. An entry and exit ramp will be constructed to allow single directional access to the elevated stockpile area, preventing the need for trucks to turn around when collecting finished quarry products and thereby improving traffic flow. Expanding the finished product stockpile area will require the clearing of approximately 1.034 hectares of native vegetation that falls outside of the approved site facilities area disturbance footprint.

3.3 Alternatives to the Proposed Modification

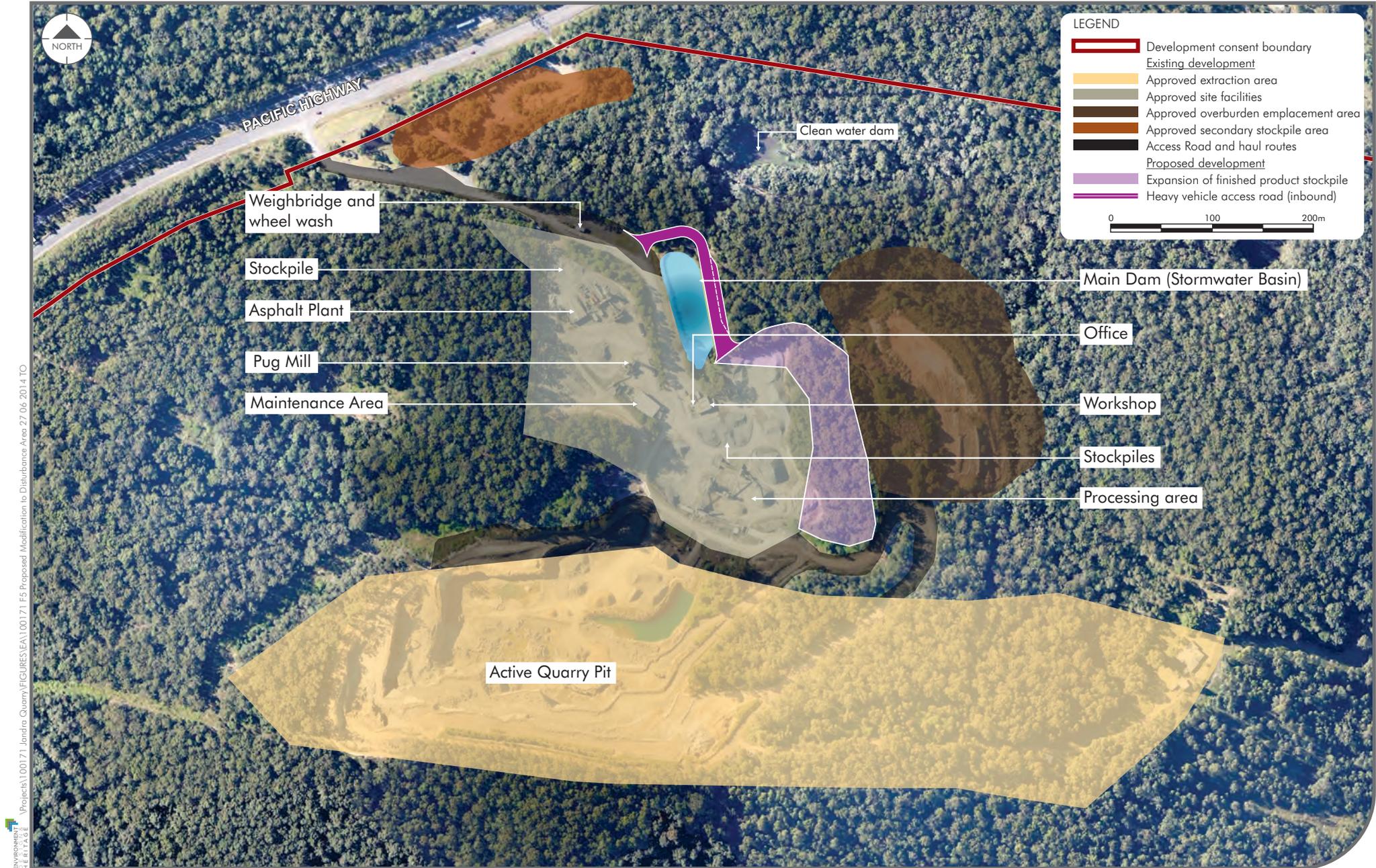
Option 1: Do Nothing Option

Operating under the production and transportation limits of the current development consent would:

- Limit the supply of quarry products to local consumers, increasing construction costs as materials need to be transported from further afield; and
- Limit employment opportunities at Jandra Quarry.

Option 2: Supply Additional Market Demand from Other Holcim Quarries

In 2013, Holcim considered transporting products from their other hard rock quarries to meet the additional market demand that could not be met from Jandra Quarry due to limitations of the existing development consent. However this option was not feasible, as the closest Holcim quarry is located in Teven (near Ballina), resulting in significant haulage distances to deliver quarry products to customers.



ENVIRONMENTAL ASSESSMENT
 PROJECTS\100171 Jandra Quarry\FIGURES\EA\100171 F5 Proposed Modification to Disturbance Area 27.06.2014 TO

3.4 Quarry Development

As outlined in Table 3, there will be no change to the approved extraction area as presented in Figure 2 or to the approved depth of extraction of RL 20.

Existing benches have been developed at 12 metre heights and it is proposed to continue with 12 metre separation down to RL 50. From this level it is proposed to develop two 15 metre high benches. Terminal bench widths are half the face height and the final face angle is 75°.

3.4.1 Current Status

Over the past 14 years since development consent was granted, extraction has been focused in the western part of the quarry pit (refer to Plate 2), to avoid disturbing the main haul roads to the upper benches, which were established on the eastern side of the quarry during early pit development. Benches have been developed at 12 metre heights to a depth of RL 50 (*i.e.* RL 50, 62, 74, 86 and 98).

Overburden and topsoil has been placed on benches RL 98 and RL 86, where terminal faces were developed on the southern limits of the pit. Bench RL 98 has been revegetated with a mixture of grasses, shrubs and trees as part of the staged rehabilitation process (refer to Plate 3), while Bench RL 86 has been planted with grasses, to be followed with woody vegetation. Additional overburden and topsoil that is stripped from the western part of the approved extraction area, that is not required for rehabilitation of terminal benches, is hauled primarily along the northern RL 62 bench to the overburden emplacement area.

After blasting and loading, dump trucks haul shot rock to the processing plant, either along the northern RL 62 bench, the southern RL 62 and RL 74 benches, or through the centre of the pit at RL 50.

A sump was created in the floor of the quarry to capture stormwater runoff from the pit (refer to Figure 5 and Plate 4).

3.4.2 Extraction Staging

Holcim have revisited the four stage quarry development schedule presented in the EIS (ERM, 1999) and have developed revised staging plans for extraction of the remaining resource over the next 30 years.

Stage 1

This stage involves expanding the quarry to the western extent of the approved extraction area and developing a new 15 metre high bench to increase the quarry depth to RL 35 (refer to Figure 6).

As terminal faces are developed on the southern and western limits, overburden and topsoil will be placed on the benches and rehabilitated. The proposed methods for rehabilitation are described in Section 6.13. Additional overburden and topsoil that is stripped from the western part of the approved extraction area that is not required for rehabilitation of terminal benches will be hauled primarily along the northern RL 62 bench to the overburden emplacement area. Excess topsoil would be stockpiled separately to overburden for later use in rehabilitation.

Dump trucks will haul shot rock to the processing plant from new western benches created at RL 74, RL 62 and RL 50, along either the northern or southern RL 62 and RL 50 benches.

Access to the RL 35 bench will be via a ramp developed along the northern face from the site facilities level of RL 50. This ramp will be used to haul shot rock from the western section of the pit, to the processing plant.

All stormwater runoff from the quarry pit will be captured in the pit dam created below RL 35. After settling, water will be pumped out of the quarry pit sump to the RL 50 level, from where it will drain via gravity into the main dam.

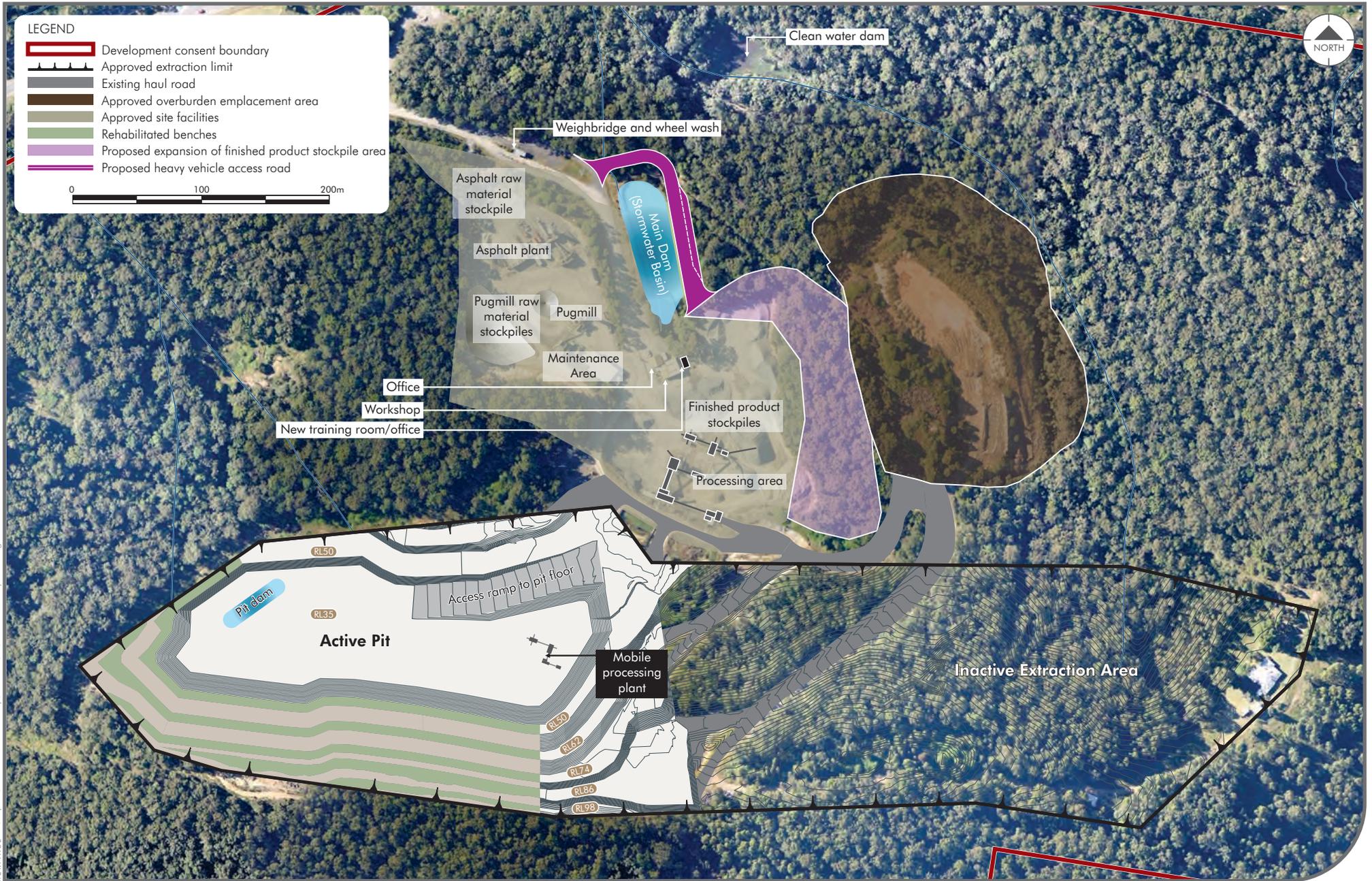
Stage 2

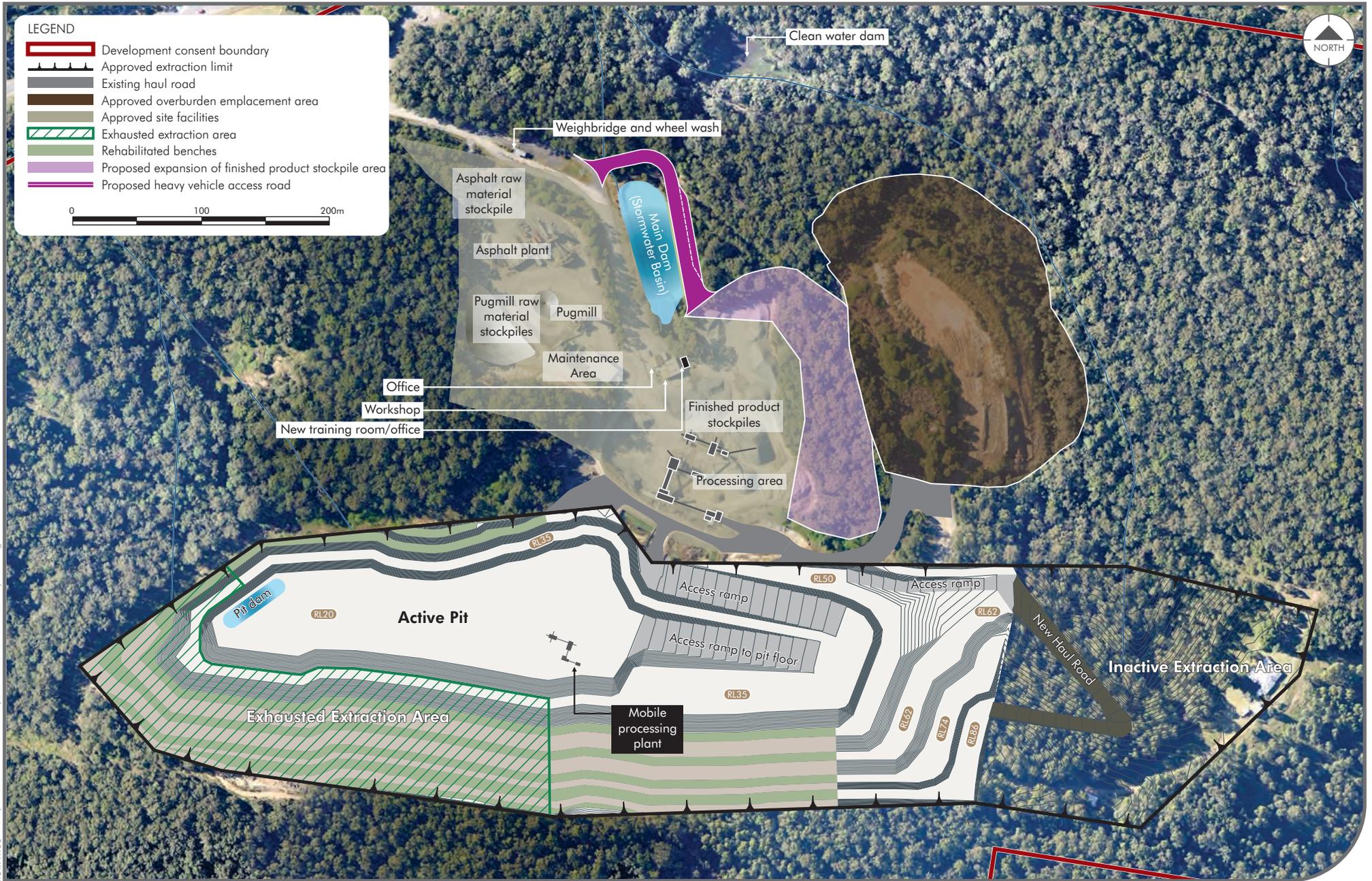
This stage involves developing a final 15 metre high bench in the western section of the quarry to increase the quarry depth to the approval limit of RL 20 (refer to Figure 7). This stage also includes the extension of the pit eastwards to a depth of RL 35.

Early in Stage 2 the existing haul roads will need to be relocated. It is proposed that two ramps are constructed within the quarry pit to provide access to the RL 35 and RL 20 benches. Access from the site facilities level of RL 50 to the RL 35 bench will be via an eastwards facing ramp, developed along the northern pit face. Access to the terminal pit floor level of RL 20 will be via a west-facing ramp developed through the centre of the pit from RL 35. These ramps will be used to haul shot rock from the pit to the processing plant. The eastern extension of the quarry pit during Stage 2 involves the removal of the original main haul roads that provided access to the southern benches. A new 'out of pit' haul road will be constructed within the far eastern section of the approved extraction area (refer to Figure 7), to provide access to the eastern RL 62, RL 74 and RL 86 benches. A third access ramp will be constructed within the pit, from the eastern RL 62 bench to the site facilities level of RL 50.

As further terminal faces are developed on the southern, western and northern limits, overburden and topsoil will be placed on benches above RL 50 for progressive rehabilitation. Additional overburden and topsoil that is stripped during the eastern extension of Stage 2, that is not required for rehabilitation of terminal benches, will be hauled to the overburden emplacement area from the RL 86, RL 74 and RL 62 benches along the new haul road. Excess topsoil would be stockpiled separately to overburden for later use in rehabilitation.

All stormwater runoff from the quarry pit will be captured on the RL 20 level. After settling, water will be pumped out of the quarry pit dam to the RL 50 level from where it will drain via gravity into the main dam.





Stage 3

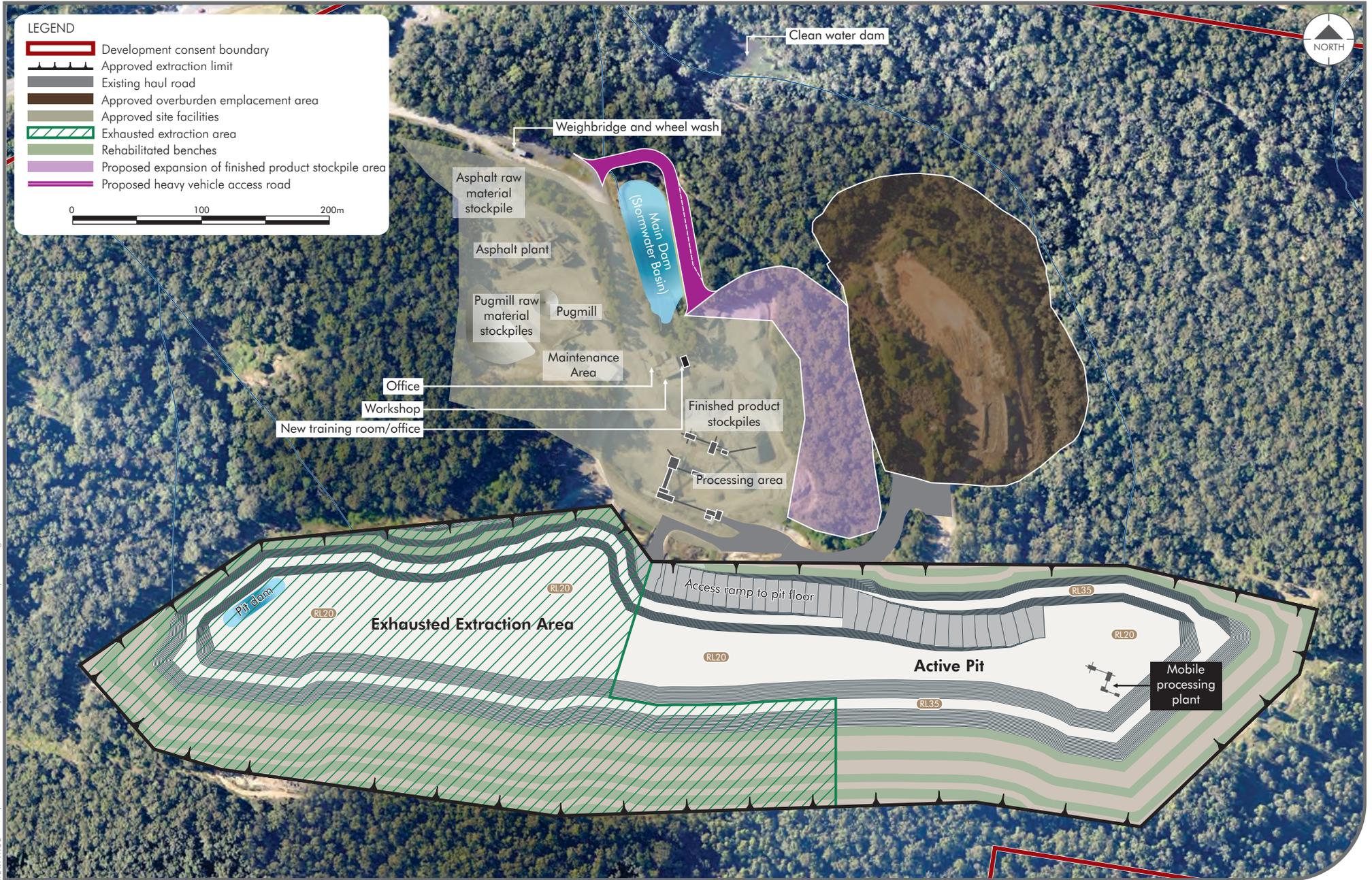
This stage involves expanding the quarry to the eastern extent of the approved extraction area and increasing the quarry depth to the approval limit of RL 20 (refer to Figure 8). At no stage will the pit cut through the eastern ridge.

Access from the site facilities level of RL 50 to the terminal pit floor level of RL 20 will be via a single east-facing ramp, developed along the northern pit face. This ramp will be used to haul shot rock from the eastern section of the pit, to the processing plant.

Again, as final terminal faces are developed on the southern, western, northern and eastern limits, overburden and topsoil will be placed on benches above RL 50 and rehabilitated. Additional overburden and topsoil that is stripped during the eastern extension of Stage 3, that is not required for rehabilitation of terminal benches, will be hauled to the overburden emplacement area from the RL 86, RL 74 and RL 62 benches.

All stormwater runoff from the quarry pit will continue to be captured on the RL 20 level in the western half of the pit. After settling, water will be pumped out of the quarry pit dam to the RL 50 level, from where it will drain via gravity into the main dam.

On completion of this stage, the quarry pit will be fully developed to the maximum approved depth and extent.



3.5 Quarry Operation

Essentially, quarry operations will be similar to the current practices, with a slight increase in operating hours. Additional machinery including a mobile processing plant (crusher), excavator, front end loader and dump truck would also be required at peak production.

The following section describes the proposed quarry operations that will be required to meet peak production of 475,000 tonnes per calendar year.

3.5.1 Site Preparation

Site preparation includes:

- The upgrade of existing and / or the installation of any erosion and sediment controls;
- Clearing of existing vegetation during eastward extension of the quarry pit, expansion of the existing finished product stockpile area and construction of the new heavy vehicle access road; and
- Removal, reuse and/stockpiling of topsoil and overburden during quarrying, expansion of the existing finished product stockpile area and construction of the new heavy vehicle access road.

Site Drainage

Extraction of material from the quarry will progress from the existing quarry pit into new extraction areas. Similarly the expansion of the finished product stockpile area will progress from the existing site facilities area. This will ensure that drainage of newly disturbed areas will always be directed back to the pit dam (refer to Plate 4) and main dam (refer to Plate 5) in order to contain sediment and to prevent this material from draining offsite and entering watercourses.

At times during quarry extension, expansion of the existing finished product stockpile area and construction of the new heavy vehicle access road, it will be necessary to install clean water divergence structures to direct clean stormwater runoff from undisturbed vegetated areas into surrounding watercourses.

Vegetation Clearing

Vegetation will be cleared progressively as the quarry develops. Clearing will be restricted to the approved quarry operations and proposed new disturbance area including the expansion of the existing finished product stockpile area (1.034 hectares) and construction of the new heavy vehicle access road (0.25 hectares) (Figure 5). Clearing is generally undertaken using a 50 tonne D8 Dozer. Wherever possible, selected foliage and branches from cleared vegetation will be placed immediately on rehabilitation areas. When no rehabilitation areas are available, it will either be windrowed or mulched and stockpiled within the approved quarry disturbance area, as close as possible to future rehabilitation areas.

Overburden Removal and Stockpiling

Quarry overburden comprises topsoil and underlying weathered rock profiles.

Topsoil

Topsoil will be stripped using a 50 tonne D8 Dozer on more gentle slopes and a 45 tonne Caterpillar 345 excavator on steeper sections. Where possible, stripped topsoil will be

immediately re-spread on rehabilitation areas to optimise regeneration of naturally occurring seed stock.

Where immediate respreading is not possible, topsoil will be stockpiled in the overburden emplacement area. Topsoil stockpiles are currently, and will continue to be constructed 1.5 metres high with 1V:3H batters and will be vegetated to protect the material, which will be used in subsequent rehabilitation programs. When possible, topsoil stockpiles will also be protected by windrowed and/or mulched vegetation.

Overburden

Weathered rock excavated as overburden will also be stockpiled in the overburden emplacement area. This material will be used for a wide range of purposes including bunding, road repairs, upgrading of drainage works, rehabilitation and construction.

A stormwater bund has been constructed along the downslope perimeter of the overburden emplacement area. This bund prevents uncontrolled, sediment laden stormwater runoff from leaving the overburden emplacement area and discharging into one of the minor tributaries of Talawahl Creek.

3.5.2 Blasting

The current practice is to use a contractor to conduct blasting at the quarry, with a 'Rock on Ground' contract, under which environmental performance is guaranteed. Overpressure and ground vibration is monitored for each blast in accordance with the development consent and EPL 2796.

A typical blast in fresh rock would have the following parameters for a 12 metre high bench.

Table 4: Typical Blast Design

Parameter	Specification
No. of Holes	55
Hole Diameter	89 mm
Burden	3 m
Spacing	3.2 m
Hole Depth	12 m
Hole Angle	10 deg
Stem Height	2.8 m
Subdrill	0.5 m
Rock Density	2.6 g/cc
Maximum Instantaneous Charge (MIC)	137 kg*
Charge per Hole	73 - 75 kg

* Based on two holes being initiated simultaneously.

Prior to each blast, holes are drilled over a period of a week in fresh rock using an Atlas Copco ECM 660 IV drill rig.

The holes are initiated using the proven non-electric method, with a Maximum Instantaneous Charge (MIC) typically 75 kilograms, as each hole will usually be initiated separately. In some cases two holes are initiated simultaneously resulting in a MIC of approximately 137 kilograms. The actual blast design used will be determined on a blast by blast basis to ensure that EPA criteria are met at all nearby residences.

A blast of these typical parameters would release approximately 20,000 tonnes and there would be a need for approximately two blasts per month totalling approximately 24 blasts per year.

For the bottom two 15 metres faces, the MIC would typically increase to 97 kilograms. These parameters have been used in assessing the likely impact of blasting as reported in Section 6.3.

The approved extraction area indicates that potential blast locations cover an area of approximately 900 metres by 250 metres. At any one location the distance between the blast site and the nearest residence vary between 500 metres and 960 metres. The Noise and Blasting Impact Assessment (SLR, 2014) identified the MIC that allows the ANZEC Guidelines for human comfort to be met, at the closest private (non-Holcim owned) residences, during all stages of the quarry development. The highest northern benches during Stage 3, are 500 metres from R1 at the closest point. The MIC for blasts at this location would need to be less than 125 kilograms to comply with the ANZEC Guidelines¹ for human comfort. For blasts in all other locations of the approved extraction area, a MIC of between 160 kilograms and 500 kilograms could be initiated, depending on the location, and would comply with the ANZEC Guidelines (refer to Table 16 in Section 6.3.2 for the identified MIC that allows the ANZEC Guidelines for human comfort to be met, at the closest non-Holcim owned residences, during all stages of the quarry development). Although the typical MIC would not exceed 137 kilograms, with significant variations in distances to receptors, it is extremely inefficient to limit blasts to a specific MIC. As is current practice, Holcim will continue to monitor blasts to gather data sufficient for confident impact predictions. The design of blasts will then be optimised to limit the possibility of EPA criteria exceedances, when blast locations are closer to residences and preferred blast designs can be used for blast locations with adequate distances to residences.

Holcim undertakes blasting in accordance with a blast management procedure. These procedures are amended by Holcim to reflect best management practices as they arise. It should be noted that there will be no secondary blasting.

Blasting will conform to current EPA guidelines.

3.5.3 Raw Materials Processing

Loading and hauling

A 30 tonne Caterpillar 345 excavator will be used to load shot rock. One of the two sales 30 tonne Caterpillar 980H front end loaders will also be used to increase loading capacity on an as needs basis.

As a dust control measure, the shot rock will be well watered down with the water cannon on a Volvo 12000 litre rigid water truck before loading out is commenced.

The shot rock will be loaded into a 40 tonne Komatsu HD325 and 35 tonne Volvo A35 dump truck and transported to the existing processing plant.

All haul roads are sprayed with the water truck between four and five times a day, with frequency adjusted to weather conditions.

¹ Australian and New Zealand Environment Council (ANZEC), *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*, September 1990.

Crushing and Screening

Existing Processing Plant

The existing processing plant has the capacity to process approximately 350,000 tonnes of rock per annum. After being deposited into the hopper by one of the two sales 30 tonne Caterpillar 980H front end loaders, the shot rock will pass through the following equipment for processing:

- Primary feeder;
- Primary crusher;
- Screen No. 1;
- Secondary crusher;
- Screen No. 2;
- Tertiary crusher;
- Barmac;
- Screen No. 3; and
- Screen No. 4.

In the existing processing plant, dust extraction and control is effected by:

- Two DCE Vokes dust extraction units;
- One Hosokawa Mikropul dust extraction unit;
- Misting sprays at primary boot and product discharge points; and
- Three screens having dust covers and are sealed, while the fourth screen is a wash screen and does not generate dust.

The existing processing plant is electrically powered.

Mobile Processing Plant

A mobile processing plant with the capacity to process approximately 125,000 tonnes of rock per annum, will be located within the quarry pit (refer to Figures 6 – 8). The mobile processing plant will include the following equipment:

- Primary crusher;
- Cone crusher; and
- Screen.

In the mobile processing plant, dust will be controlled by misting sprays located before and after the primary and cone crushers.

The mobile processing plant will be powered by three 500 KVA diesel powered generators.

An extra 30 tonne Caterpillar 345 excavator will be required to feed shot rock into the primary feeder of the mobile processing plant, while an extra 30 tonne Caterpillar 980H front end loader (in addition to the two sales 30 tonne Caterpillar 980H front end loaders) will be required for stockpiling and loading the additional final product onto trucks for delivery.

Finished Product Stockpiling

After the final products exit the screens of both the existing and proposed mobile processing plants, they are transported to the finished product stockpiles (refer to Plate 6) by three sales 30 tonne Caterpillar 980H front end loaders.

The majority of the finished product stockpiles are fitted with sprinkler systems to suppress dust before product is loaded onto trucks. The water cannon on the water truck is used to spray those stockpiles which are not fitted with sprinkler systems, before products are loaded out. The water truck is also used to spray all heavily trafficked areas on site.

After load-out into road trucks, all products are weighed over the on-site weighbridge, before being dispatched to their respective markets.

Pugmill

The existing pugmill is used either to add water in a controlled way so that road base can be delivered at Optimum Moisture Content, or to add stabiliser such as lime or cement to the product. The location of the pugmill is indicated in Figure 5. Water for the pugmill is sourced from the main dam. The pugmill includes a lime or cement filler silo. The pugmill also has the capacity to produce pre-coated products. One of the 30 tonne Caterpillar 980H front end loaders will continue to be used to service the pugmill when required.

3.5.4 Asphalt Plant

The existing development consent allows for a mobile asphalt plant capable of producing around 100 - 200 tonnes per hour to be located on-site on an as needs basis. It is proposed to operate the mobile asphalt plant 24 hours on a campaign basis, primarily to cater for night road works.

The location of the asphalt plant is indicated in Figure 5. The asphalt plant will combine crushed stone that is produced on-site, with bitumen to produce asphalt. For the process, deliveries of bitumen, lime and sand will be made to the site via tankers and tip trucks. Hydrated lime or fly ash will be stored in a silo and used as filler. In addition, small quantities of toluene and methylated spirits will be used in routine laboratory testing. One of the 30 tonne Caterpillar 980H front end loaders will be used to transport materials around the site.

3.5.5 On-Site Facilities and Utilities

The existing site facilities and utilities are able to accommodate the proposed intensification in production. The only additional site facility that will be required is a 6 metre x 3 metre portable building for training and administrative purposes. The portable building will be located immediately north-east of the existing office block, within the approved site facilities area (refer Figure 5).

3.5.6 Transport

The quarry has an exclusive access to the Pacific Highway *i.e.* it is not shared with public road users. The Pacific Highway - Jandra Quarry intersection is a standard seagull configuration comprising the following:

- A left turn deceleration lane in the northern approach;
- A right turn bay in the southern approach; and
- A right turn acceleration lane with a seagull channelisation for trucks turning right out of the site to travel north.

The speed limit on the Pacific Highway in the vicinity of the intersection is 110km/h.

The markets for quarry products are located both north and south of the quarry. Historical traffic volumes have been split approximately 60 percent to the south and 40 percent to the

north, while over more recent years this split has changed to 50/50 and is likely to remain as such during future operations.

At peak demand, the maximum number of heavy vehicles leaving the site to deliver product to customers would reach approximately 12 (24 truck movements) per hour. This has been calculated based on a minimum loading time of approximately 5 minutes per truck. It is unlikely that, on a typical day, these peaks in demand will occur for more than a few hours at a time.

3.5.7 Workforce

The proposed workforce and respective roles are outlined in Table 5.

An additional three full time employees as well as an additional three truck drivers will be required to support the proposed increase in production.

Table 5: Proposed Workforce

Employee Role	Numbers Required
Quarry Manager	1
Production Supervisor	1
Weighbridge Operator/Dispatcher	1
Processing Plant Operator	1
Excavator Operator	1
Front End Loader Operator	2
Dump Truck Operator	2
Water Truck Operator	1
Truck Drivers	10

A significant number of local people will also be indirectly employed as drivers and maintenance contractors as well as through service industries (e.g. fuel supply, spare parts).

3.5.8 Operating Hours

Quarrying and processing of rock, with the proposed increase in production, will occur between 6 am and 10 pm Monday to Friday and 6 am to 6 pm Saturday. Although most of the product deliveries will be undertaken during quarry operating hours, trucks may need to return to the quarry site between 10 pm and 12 am when deliveries are outside of the local area (e.g. Newcastle). Ancillary operations such as refuelling, servicing and maintaining plant will be undertaken between 6 am and 10 pm Monday to Saturday.

Blasting hours are not proposed to change and will continue to be restricted to between 9 am and 5 pm Monday to Friday and 9 am to 3 pm Saturday.

The asphalt plant will operate 24 hours a day (Monday to Sunday) on a campaign basis to cater for night road works.

3.5.9 Energy Demand

The quarry is a net consumer of energy. Currently the operation uses on average 15,000 litres of diesel (on site), 14,683 litres of diesel (transport fleet off site) and 46,178 kilowatt hours of electricity per month.

With the proposed increase in production diesel usage is likely to increase to a monthly average of approximately 28,000 litres (on site) and 27,708 litres (transport fleet off site)

while electricity consumption is likely to increase to a monthly average of approximately 85,700 kilowatt hours.

3.5.10 Waste Management

General Waste

Small quantities of waste will be generated throughout the quarry's operational life. This includes:

- General amenities waste;
- Waste oil;
- Tyres;
- Scrap metal; and
- Paper/cardboard, plastic and glass (e.g. bottles).

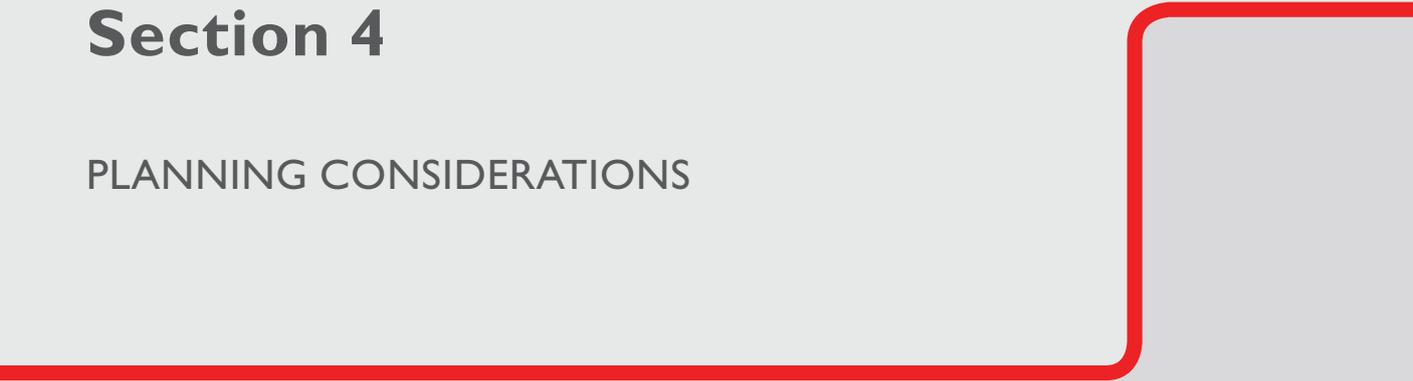
Waste oil, tyres, scrap metal, paper/cardboard and plastic/glass are recycled. General waste is disposed of at the Tuncurry Waste Management Centre.

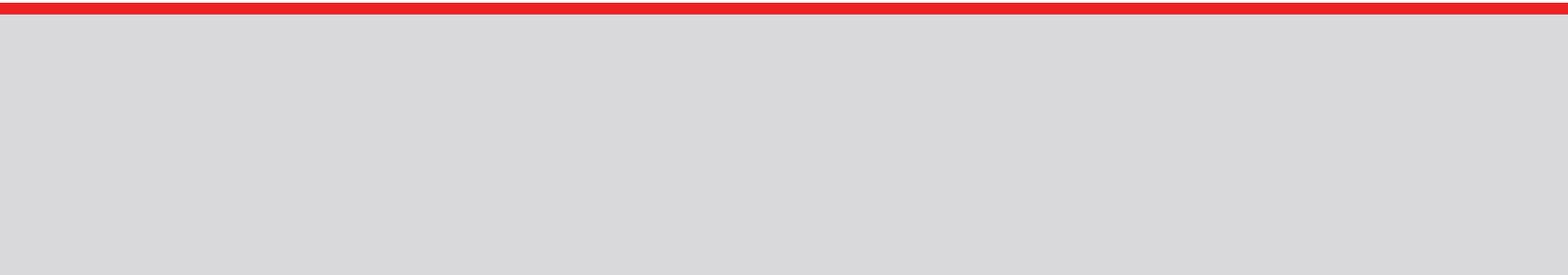
Concrete Waste

Concrete wash out material is generated at Holcim's regional concrete batching plants. Holcim propose to transport this material to Jandra Quarry for recycling. Concrete wash out material would be stockpiled on site in bunded areas. The cured concrete would then be blended with quarry raw product to produce road base for the local market. A total of approximately 250 tonnes per month or 3000 tonnes per year would be processed on site.

Section 4

PLANNING CONSIDERATIONS





4 PLANNING CONSIDERATIONS

The following section identifies the applicable local and regional planning instruments, the relevant State and Commonwealth environment and planning legislation, and discusses the relevant planning approval process applicable to the proposed modification.

4.1 Regional and Local Environmental Planning Instruments

4.1.1 Mid North Coast Regional Strategy

The Mid North Coast Regional Strategy has been developed by DP&I to ensure that adequate land is available and appropriately located to accommodate the projected housing and employment needs of the region's population over the next 25 years. While it is clear that expected growth can be accommodated in the region, the Strategy places limits on growth in some areas where the value of environmental/ cultural assets and natural resources is high. The importance of providing for employment land to provide increased capacity for new jobs is also addressed within the Strategy.

The Jandra Quarry is recognised as being a Regionally Significant Extractive Resource by the Strategy. The Strategy recognises the importance of the regions natural resources and aims to protect the existing resources, which includes farmland, extractive resources, energy resources and timber from urban and rural residential development, by requiring appropriate buffers to be provided when development occurs near the resource locations.

4.1.2 Greater Taree Local Environmental Plan 2010

The land which is the subject of the proposed modification is located wholly within the Greater Taree LGA. Under the Greater Taree Local Environmental Plan 2010 (LEP 2010), the land is zoned RU1 – Rural Production. Extractive industries are permitted with development consent within the RU1 zone.

4.2 EP&A Act

As discussed in Section 3, it is proposed to modify DA231-10-99 under Section 75W of the EP&A Act. Further details of this approval pathway are provided below.

The *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) clause 8J(8) prescribes how, in certain circumstances, a development consent can be modified under Section 75W of the EP&A Act. Clause 8J(8) states that:

(8) For the purposes only of modification, the following development consents are taken to be approvals under Part 3A of the Act and section 75W of the Act applies to any modification of such a consent:

(a) a development consent granted by the Minister under section 100A or 101 of the Act;

(b) a development consent granted by the Minister under State Environmental Planning Policy No 34 - Major Employment-Generating Industrial Development;

(c) a development consent granted by the Minister under Part 4 of the Act (relating to State Significant Development) before 1 August 2005 or under clause 89 of Schedule 6 to the Act;

(d) a development consent granted by the Land and Environment Court, if the original consent authority was the Minister and the consent was a kind referred to in paragraph (c).

The development consent, if so modified, does not become an approval under Part 3A of the Act.

DA231-10-99 was granted consent under Part 4 of the EP&A Act in 2000. The development approved was classified as State Significant Development. Clause 8J(8)(c) of the EP&A Regulation therefore applies to DA231-10-99.

Although Part 3A was repealed in 2011, Schedule 6A, clause 12 of the EP&A Act provides for the continued use of Section 75W to modify the development consents referred to in clause 8J(8) of the EP&A Regulation. Schedule 6A, clause 12 of the EP&A Act states:

12 Continuing application of Part 3A to modifications of certain development consents

Section 75W of Part 3A continues to apply to modifications of the development consents referred to in clause 8J(8) of the Environmental Planning and Assessment Regulation 2000, and so applies whether an application for modification is made before or after the commencement of this clause.

It is therefore considered that Section 75W is the appropriate approval pathway for the proposed modification.

4.3 Other State Legislation and Environmental Planning Instruments

A summary of the other State environment and planning legislation potentially relevant to the proposed modification is provided in Table 6.

Table 6: Summary of State Legislation and Relevance to the Proposed Modification

Planning Provision	Comments	Further Approval Required
<i>Protection of the Environment Operations Act 1997</i> (POEO Act)	<p>The POEO Act is administered by the Environment Protection Authority (EPA) and requires licences for environmental protection including waste, air, water and noise pollution control.</p> <p>The Jandra Quarry EPL 2796 provides for extractive activity as well as crushing, grinding and separating with a production rate of between 100,000 and 500,000 tonnes per annum. More specifically, the EPL (Condition A1.2) directly references the production limit within DA231-10-99 MOD 4: <i>Notwithstanding the fee scales noted above, the licensee must not produce more than 250,000 tonnes of finished quarry products per calendar year.</i></p> <p>The proposed modification will not trigger additional scheduled activities under the POEO Act. However, variation/s to the EPL would be required as a result of the proposed modification (particularly Condition A1.2).</p> <p>The requirement to vary the EPL will be confirmed by the EPA after review of the EA. Note: The EPA were consulted during the preparation of the EA and indicated that they wished to comment on the proposal after reviewing the full EA and associated technical studies when on public exhibition.</p>	Possible

Planning Provision	Comments	Further Approval Required
<p><i>Crown Lands Act 1989</i> (Crown Lands Act)</p>	<p>The Crown Lands Act provides for the administration and management of Crown land in the eastern and central divisions of NSW. Crown land may not be occupied, used, sold, leased, dedicated, reserved, or otherwise dealt with unless authorised by this Act or the <i>Crown Land (Continued Tenured) Act 1989</i>. A Crown Road Reserve adjoins the southern boundary of the site (refer to Figure 3), however the proposed modifications will not affect this parcel of land. No further approvals are required under the Crown Lands Act.</p>	No
<p><i>Water Management Act 2000</i> (WM Act)</p>	<p>Jandra Quarry does not currently extract any water from a surface water body, which is the subject of a Water Sharing Plan. No water is proposed to be extracted from a surface water body, which is the subject of a Water Sharing Plan as a result of the proposed modification.</p> <p>The provisions of the WM Act do not apply to the proposed modification.</p>	No
<p><i>Water Act 1912</i> (Water Act)</p>	<p>Some of the licencing provisions of the Water Act still apply. The Water Act is administered by the NSW Office of Water (NoW). Under the Act, a permit and/or licence must be obtained to extract water not covered by a water sharing plan under the WM Act (Part 5 of the Act) if the extraction volume exceeds the harvestable right for the property.</p> <p>Jandra Quarry currently holds a license for extraction of 5 ML of water per annum from the 'clean water' dam located in an undeveloped part of the property, approximately 100 metres to the northeast of the main dam (refer to Figure 2). As outlined in Section 6.5, the proposal does not require the extraction of water from the creek system or from dams with capacities above the harvestable rights dam capacity. The proposal does not require extraction of more than 5 ML from the clean water dam.</p> <p>An approval under the Water Act is not a requirement of the proposed modification.</p>	No
<p><i>National Parks and Wildlife Act 1974</i> (NPW Act)</p>	<p>The NPW Act is the primary piece of legislation for the protection of Aboriginal cultural heritage in New South Wales. The Office of Environment and Heritage (OEH) administer the NPW Act. The NPW Act provides statutory protection for Aboriginal objects by making it illegal to harm Aboriginal objects and Aboriginal places. Under the NPW Act, impacts on Aboriginal sites require approval. It is noted that an existing approval to impact four previously recorded Aboriginal sites that fall within the approved quarry disturbance area is held for the quarry (refer to Section 6.7).</p> <p>The proposed modification will result in a relatively minor increase in the approved project disturbance area. An Aboriginal heritage due diligence assessment has been undertaken for the new areas proposed to be disturbed (refer to Section 6.7). No Aboriginal heritage sites were identified and therefore no further approvals are required under the NPW Act.</p>	No
<p><i>Threatened Species Conservation</i></p>	<p>Under the EP&A Act, impacts on threatened species listed under the TSC Act are required to be assessed.</p> <p>The proposed modification will result in a minor increase in the</p>	Yes

Planning Provision	Comments	Further Approval Required
<p><i>Act 1995</i> (TSC Act)</p>	<p>approved project disturbance area, which requires the clearing of approximately 1.284 hectares of native vegetation. A flora and fauna impact assessment has been undertaken for the proposed new disturbance impacts as well as the potential operational impacts associated with the intensification in production. The assessment concluded that no threatened fauna species listed under the TSC Act would be impacted by the proposed modification. However, habitat potentially suitable for a threatened species of orchid, the Eastern Underground Orchid, has been identified within the flora and fauna assessment study area. As the survey timing was not appropriate for this species, which only flowers between September and November, targeted surveys will need to be undertaken during spring to confirm whether this species is present within the proposed disturbance footprint. Therefore further assessment is required under the TSC Act.</p>	
<p><i>Dam Safety Act 1978</i> (Dam Safety Act)</p>	<p>This Act requires that the NSW Dams Safety Committee (DSC) periodically review large dams that may constitute a hazard to human life and property. These dams are known as prescribed dams and are listed in Schedule 1 of the Dams Safety Act. Any new prescribed dams are to be designed to the satisfaction of the DSC. The capacity of the main on-site dam does not need to be increased, while an increase in the volume of the pit dam is proposed, when the existing pit dam is repositioned, as the depth of the quarry increases from the current RL 50 to RL 35 and ultimately to RL 20. It is highly unlikely that the repositioned and expanded pit dams, would constitute a hazard to human life and property and be prescribed. The proposed modification would therefore not require approval under the Dams Safety Act.</p>	No
<p><i>Heritage Act 1977</i> (Heritage Act)</p>	<p>This Act includes provisions relating to the protection and management of heritage items (historic heritage). The proposed modification will result in a relatively minor increase in the approved project disturbance boundary. A heritage due diligence assessment has been undertaken for the new areas proposed to be disturbed. No historic heritage sites were identified and therefore no further approvals are required under the Heritage Act.</p>	No
<p><i>Native Vegetation Act 2003</i> (NV Act)</p>	<p>The NV Act provides for the protection from clearing of native vegetation primarily within regional areas of NSW. Clearing of vegetation on land zoned under Council's LEP as RU1 - Primary Production is regulated under the NV Act and may be cleared in accordance with a development consent granted in accordance with this Act. There are certain exemptions under the provisions of the NV Act which apply to the proposed modification. Where the clearing of native vegetation is assessed under the EP&A Act a separate approval is not required under the NV Act.</p>	No
<p><i>Roads Act 1993</i> (Roads Act)</p>	<p>Under Section 138 of the Road Act, consent is required to erect a structure or carry out work in, on or over a public road. The proposed modification will result in an increase in the number of heavy vehicle movements through the existing intersection at the site entrance onto the Pacific Highway. A traffic impact assessment has been undertaken and has confirmed that modifications to the</p>	No

Planning Provision	Comments	Further Approval Required
	existing intersection will not be required. The proposed modification will therefore not require approval under the Road Act.	
<i>Contaminated Lands Management Act, 1997</i> (CLM Act)	This Act establishes a process for investigating, and where required remediating contaminated lands, that pose a risk to human health and the environment. An EPA Contaminated Land Record search was undertaken in February 2014 and no sites were recorded within the Greater Taree LGA. Three separate site surveys were also undertaken during the preliminary planning phase, of the proposed new disturbance area and no evidence of contamination or potentially contaminating activities were identified. In the event that previously unidentified contaminated land is located during construction, requirements of this Act would need to be complied with. No further assessment of contaminated land is therefore required.	No

The relevant State Environmental Planning Policies (SEPP) which need to be considered in relation to the proposed modification are outlined in Table 7.

Table 7: SEPPS Relevant to the Proposed Modification

SEPP	Comment
SEPP No. 33 – Hazardous and Offensive Development	SEPP No. 33 requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. Jandra Quarry is not classified as hazardous or offensive under SEPP No. 33. No further assessment under SEPP No. 33 is required.
SEPP No. 44 – Koala Habitat Protection	SEPP No. 44 restricts the granting of development consent for proposals on land identified as core koala habitat without preparation of a plan of management. The proposed modification will result in a relatively minor increase in the approved project disturbance area, which will require the clearing of approximately 1.284 hectares of native vegetation. A flora and fauna assessment has been undertaken for the new areas proposed to be disturbed, which focused on the identification of core koala habitat. The assessment concluded that the proposed modification to the approved project disturbance area would not include land identified as core koala habitat. A koala plan of management is therefore not required.
SEPP No. 55 – Remediation of Land	SEPP No. 55 aims to provide a state-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by consideration of contaminated land as part of the planning process. Under SEPP No. 55 a consent authority must not consent to the carrying out of development on land unless it has considered potential contamination issues. An EPA Contaminated Land Record search was undertaken in February 2014 and no sites were recorded within the Greater Taree LGA. Three separate site surveys were also undertaken during the preliminary planning phase, of the proposed new disturbance area and no evidence of contamination or potentially contaminating activities were identified. In the event that previously unidentified contaminated land is located during construction, requirements of this SEPP would need to be complied with.

SEPP	Comment
	No further assessment of contaminated land or land remediation is required.
SEPP (Mining, Petroleum Production and Extractive Industries) 2007	This SEPP regulates the permissibility of mining, extractive industries and related development and specifies matters that must be considered in assessing extractive industry developments requiring consent under Part 4 of the EP&A Act. The proposed modification is not considered exempt or complying development under the SEPP and therefore requires consent.
SEPP (State and Regional Development) 2011	This SEPP identifies State Significant Development. The original development, approved in March 2000, was declared State Significant Development under provisions predating this SEPP and was granted approval under Part 4 of the EP&A Act prior to 1 August 2005. Therefore the proposed modification is to be considered under Section 75W of the EP&A Act.

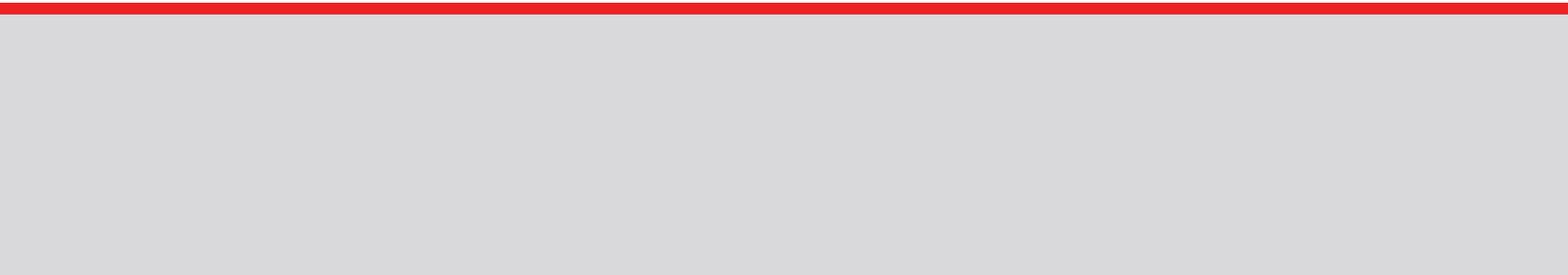
4.4 Commonwealth Legislation

A review of the current Commonwealth legislation that is relevant to the proposed modification is provided in Table 8.

Table 8: Summary of Commonwealth Legislation and Relevance to the Proposed Modification

Planning Provision	Comments	Further Approval Required
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	<p>Under the EPBC Act, approval from the Minister for the Environment is required for any action that would result in a significant impact to Matters of National Environmental Significance (MNES). The nine matters of national environmental significance (MNES) are:</p> <ul style="list-style-type: none"> ▪ World heritage properties; ▪ National heritage places; ▪ Wetlands of international importance (Ramsar wetlands); ▪ Nationally threatened species and ecological communities; ▪ Migratory species; ▪ Commonwealth marine areas; ▪ The Great Barrier Reef Marine Park; ▪ Nuclear actions (including uranium mining); ▪ A water resource, in relation to coal seam gas development and large coal mining development. <p>The proposed modification will result in a minor increase in the approved project disturbance area, which requires the clearing of approximately 1.284 hectares of native vegetation. A flora and fauna assessment has been undertaken for the new areas proposed to be disturbed, which focused on the identification of core koala habitat (koalas are listed under the EPBC Act as a nationally threatened species). The assessment concluded that the proposed modification to the approved project disturbance area would not include land identified as core koala habitat and therefore no threatened fauna species listed under the EPBC Act would be impacted.</p> <p>However, habitat potentially suitable for the EPBC listed Eastern Underground Orchid, has been identified within the proposed new disturbance area. As the survey timing was not appropriate for this species, which only flowers between September and November, targeted surveys will need to be undertaken during spring, to confirm</p>	Possible

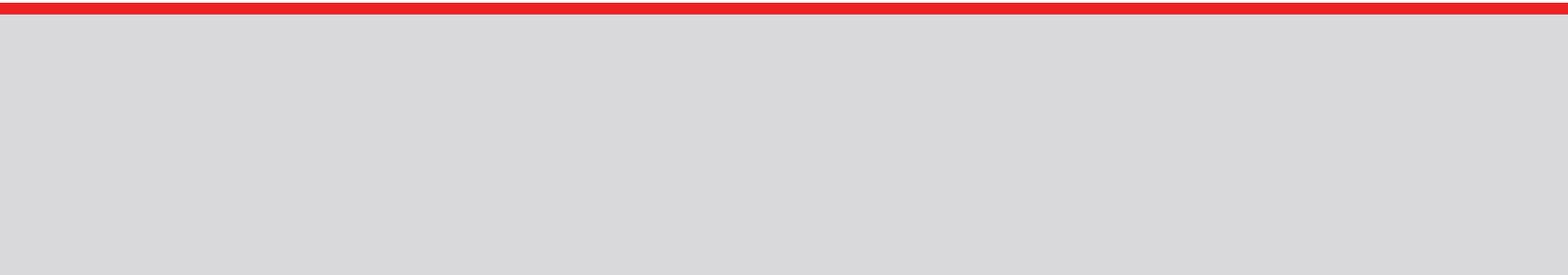
Planning Provision	Comments	Further Approval Required
	whether this species is present within the proposed disturbance footprint. Should this species be detected, consideration will be given to the preparation of a referral to the Department of the Environment (DotE) in accordance with the EPBC Act.	
<i>Native Title Act 1993</i> (NT Act)	The NT Act is administered by the National Native Title Tribunal. The Tribunal is responsible for maintaining a register of native title claimants and bodies to whom native title rights have been granted. The NT Act prescribes that native title can be extinguished under certain circumstances, including the granting of freehold land. There is no Crown land located within the development consent boundary or the new areas to be disturbed as part of the proposed modification. Native Title has been extinguished.	No



Section 5

CONSULTATION AND STAKEHOLDER
ENGAGEMENT





5 CONSULTATION AND STAKEHOLDER ENGAGEMENT

Preparation of the EA involved consultation with the Department of Planning and Environment (DP&E), the Greater Taree City Council, a number of key government agencies, the Local Aboriginal Land Councils and the local community.

Comments obtained through the consultation process assisted in identifying all environmental and social issues associated with the proposed intensification in production and have been considered in:

- The assessment of impacts associated with the proposed modification;
- Preparing concept designs for the proposed infrastructure upgrades; and
- Developing appropriate safeguards and environmental management measures.

Tables 9 and 10 provide a summary of the issues that have been raised during both stakeholder and community consultation respectively and provides reference to the section of the EA in which these issues have been addressed.

All relevant government stakeholders, LALCs and the local community will be advised of the public exhibition of the EA. A copy of the EA will be made available for review on the Department of Planning and Environment's website, and at the Greater Taree City Council offices.

Table 9: Summary of Stakeholder Consultation

Stakeholder	Consultation Details	Comments	Response/EA Section Reference
<p>Department of Planning and Environment (DP&E)</p>	<p>Meeting held with DP&E on 14 February 2014 to discuss the proposed modification, prior to the submission of the Background Scoping Document (BSD). The BSD was submitted to DP&E on 11 March 2014 and was accepted by DP&E on 12 March 2014.</p>	<p>An email dated 12 March 2014 (refer to Appendix A) was received from DP&E accepting the BSD and included the following comments:</p> <ol style="list-style-type: none"> 1. Holcim is encouraged to consult directly with relevant agencies during the preparation of the EA and ensure that it engages in an effective program of consultation with its neighbours; 2. The EA is to specifically describe the types of vegetation proposed to be cleared and the area of each vegetation type proposed to be cleared in hectares. The EA is also to consider measures to mitigate the loss of native vegetation and habitat values (such as tree hollows); 3. Socio-economic matters are to be assessed in a thorough manner. The BSD identifies these matters as being "low risk". However, these are important matters that should be given due weight (and quantification, wherever possible) in the EA; and 4. As consent is being sought for a 30 year period, the consent is likely to be in force at the time of quarry closure. The EA must contain conceptual quarry closure information about the process to be employed at that time to determine final land use(s) and decommissioning. 	<ol style="list-style-type: none"> 1. All relevant government agencies have been thoroughly consulted with during the preparation of the EA as outlined in this chapter; 2. Refer to Section 6.6 for an assessment of the impacts on flora and fauna; 3. Socio-economic matters have been fully considered in Section 6.9;and 4. Refer to Section 6.13 for information on decommissioning, quarry closure and final land use(s).
<p>Greater Taree City Council (GTCC)</p>	<p>Contacted GTCC on 26 May 2014 and discussed the details of the proposed modification. Emailed the Background Scoping Document (BSD) to GTCC on 26 May 2014. Holcim and Element met with GTCC on 2 April 2014.</p>	<p>GTCC did not raise any issues with the proposed modification.</p>	<p>Noted.</p>

Stakeholder	Consultation Details	Comments	Response/EA Section Reference
Roads and Maritime Services (Roads and Maritime)	Contacted Roads and Maritime on 26 May 2014 and discussed the details of the proposed modification. Emailed the BSD to Roads and Maritime on 26 May 2014 requesting comment on the proposed scope of the traffic impact assessment. Offered to meet with Roads and Maritime if they required. Provided the draft Traffic Impact Assessment (TIA) to Roads and Maritime on 7 June for their review and comment.	Roads and Maritime advised that they did not require a meeting with Holcim. Roads and Maritime advised in an email dated 13 June 2014 (refer Appendix A) that the TIA appears satisfactory. However Roads and Maritime noted that the traffic volumes used in the TIA are based on 2011 counts and suggested that fresh counts would have been better.	Refer to Section 6.2 which provides a discussion on the validity of the 2011 traffic data.
Office of Environment and Heritage (OEH)	Contacted OEH on 26 May 2014 and discussed the details of the proposed modification. Emailed the BSD to OEH on 26 May 2014 requesting comment on the proposed scope of the fauna and flora and Aboriginal heritage assessments. Offered to meet with OEH if they required.	OEH advised that they did not required a meeting with Holcim. OEH advised in a letter dated 6 June 2014, that they have not reviewed the BSD. OEH recommended that the EA be prepared taking into consideration their standard Secretary's Environmental Assessment Requirements (refer to Appendix A). The three key issues that OEH require to be addressed include: 1. Flooding; 2. Aboriginal cultural heritage; and 3. Biodiversity.	<ol style="list-style-type: none"> 1. No assessment of flood risks is required as the Jandra Quarry is not located in an area susceptible to flooding (refer to Section 6.10); 2. Refer to Section 6.7; and 3. Refer to Section 6.6.
Environment Protection Authority (EPA)	Contacted EPA on 26 May 2014 and discussed the details of the proposed modification. Emailed the BSD to EPA on 26 May 2014 requesting comment on the proposed scope of the air quality, noise and blasting and surface	EPA advised during a phone discussion on 26 May 2014 that the main issues they would be interested in are noise and blasting, air quality and surface water management. EPA confirmed in a subsequent phone discussion that they had reviewed the BSD and were satisfied with the scope of the relevant technical studies. EPA confirmed that they did not required a	Impacts of the proposed intensification in production on noise and blasting, air quality and surface water management are presented in Sections 6.3, 6.4 and 6.5 respectively.

Stakeholder	Consultation Details	Comments	Response/EA Section Reference
	water management assessments. Offered to meet with EPA if they required.	meeting with Holcim and that they would provide further comment if required, after reviewing the EA and associated specialist studies when they were placed on exhibition.	
Department of Primary Industries (Office of Water (NoW)) (a division of NSW Trade and Investment)	Contacted NoW on 27 May 2014 and discussed the details of the proposed modification. Emailed the BSD to NoW on 27 May 2014 requesting comment on the proposed scope of the surface water management assessment. Offered to meet with NoW if they required.	NoW advised that they did not required a meeting with Holcim. NoW advised in a letter dated 16 June 2014, that they had reviewed the BSD and requested consideration of the following key issues in the preparation of the EA (refer Appendix A): <ol style="list-style-type: none"> 1. Preparation of a water balance, outlining the proposed water management on the site including details of any water reticulation infrastructure that supplies water to and within the site. 2. An impact assessment of any proposed works within or adjacent to watercourses including consideration of the ability to achieve the principles of the <i>Water Management Act 2000</i> (WMA) and the requirement for a controlled activity approval. 3. Preparation of a site water management plan to integrate the proposed water balance and management for the site and to identify adequate mitigating and monitoring requirements for both water quality and water volume. 4. Existing and proposed water licensing requirements in accordance with the <i>Water Act 1912</i> and the WMA. 	The key issues raised by NoW are addressed in Section 6.5.
Local Land Services (LLS) (Hunter) (previously the Catchment Management Authorities)	Contacted LLS on 26 May 2014 and discussed the details of the proposed modification. Offered to send the BSD to LLS.	LLS advised during a phone discussion on 26 May 2014 that the main issues they would be interested in are surface water management and biodiversity. LLS advised that they did not require a copy of the BSD but that they would require a copy of the EA when it is placed on exhibition.	Impacts of the proposed intensification in production on surface water management and biodiversity are presented in Sections 6.5 and 6.6 respectively.
NSW Trade & Investment,	Contacted DRE on 27 May 2014	DRE advised during a phone discussion on 27 May	Noted.

Stakeholder	Consultation Details	Comments	Response/EA Section Reference
Division of Resources & Energy (DRE)	and discussed the details of the proposed modification. Offered to send the BSD to DRE.	2014 that they did not require a copy of the BSD but that they would require a copy of the EA when it is placed on exhibition.	
Purfleet - Taree Local Aboriginal Land Council (LALC)	The Purfleet – Taree LALC were invited by phone and email to attend a site visit as part of the Aboriginal heritage Due Diligence Assessment. A copy of the Aboriginal Due Diligence Assessment report was emailed to the Purfleet – Taree LALC on 2 June 2014 for their review and comment.	A representative from the Purfleet – Taree LALC attended the site visit as part of the Aboriginal heritage Due Diligence Assessment. No comment was provided by the Purfleet – Taree LALC on the Aboriginal heritage Due Diligence Assessment report.	The findings of the Aboriginal heritage Due Diligence Assessment are provided in Section 6.7.
Forster Local Aboriginal Land Council	The Forster LALC were invited by phone and email to attend a site visit as part of the Aboriginal heritage Due Diligence Assessment. A copy of the Aboriginal Due Diligence Assessment report was emailed to the Forster LALC on 2 June 2014 for their review and comment.	The Forster LALC did not send a representative to attend the site visit as part of the Aboriginal heritage Due Diligence Assessment. No comment was provided by the Forster LALC on the Aboriginal heritage Due Diligence Assessment report.	The findings of the Aboriginal heritage Due Diligence Assessment are provided in Section 6.7.

Table 10: Summary of Community Consultation

*Ref #	Address	Consultation Details	Comments	Response/EA Section Reference
R1	15418 Pacific Highway, Possum Brush	Contacted by phone and introduced the proposed modification.	R1 advised that they have no interest in the activities at the quarry.	Although R1 (the closest residence to the quarry) may not be interested in the Jandra quarry operations, potential impacts on R1 associated with the intensification in production have been fully considered in this EA and associated technical studies.
R2	112 Spicers Road, Rainbow Flat	Contacted by phone and introduced the proposed modification. R2 met with Holcim at their offices on 25 March 2014 to discuss the details of the proposed intensification in production. R2 provided an email to Holcim dated 11 April 2014 confirming their primary concern. A meeting was held at R2 on 5 June 2014. R2 also attended a meeting with various other neighbours at R17 on 5 June 2014.	The primary concern raised by R2 is the odour that they experienced from the previous asphalt plant. R2 also noted that they could sometimes hear the reversing beepers from machinery during the day and wouldn't like to hear that at night. R2 were also interested in whether they would experience any greater impacts from blasting and whether the extraction of resource down to RL 20 would affect the local groundwater, thereby affecting the water level in their dam.	Impacts of the proposed intensification in production on noise and blasting, air quality and groundwater are presented in Sections 6.3, 6.4 and 6.10 respectively.
R3	15165 Pacific Highway, Possum Brush	Proposed intensification in production introduced to R3.	R3 advised that they could smell the previous asphalt plant.	Impacts of the proposed intensification in production on air quality are presented in Section 6.4.
R4 & R5	15215 Pacific Highway, Possum Brush	R4 and R5 are owned by the same parties. A meeting was held at R5 on 2 April 2014 to discuss the details of the proposed intensification in production.	R5 advised that they are not adverse to the proposed intensification in production. One of the residents at R5 is an ecologist and suggested that potential impacts on fauna from noise, light spill and death due to increased truck movements, should be considered. R5 noted that although they don't have an issue with blasting, their home sometimes shakes during blasts and they are not sure if it is as a result of blasting at the Pacific	Impacts of the proposed intensification in production on biodiversity are presented in Section 6.6.

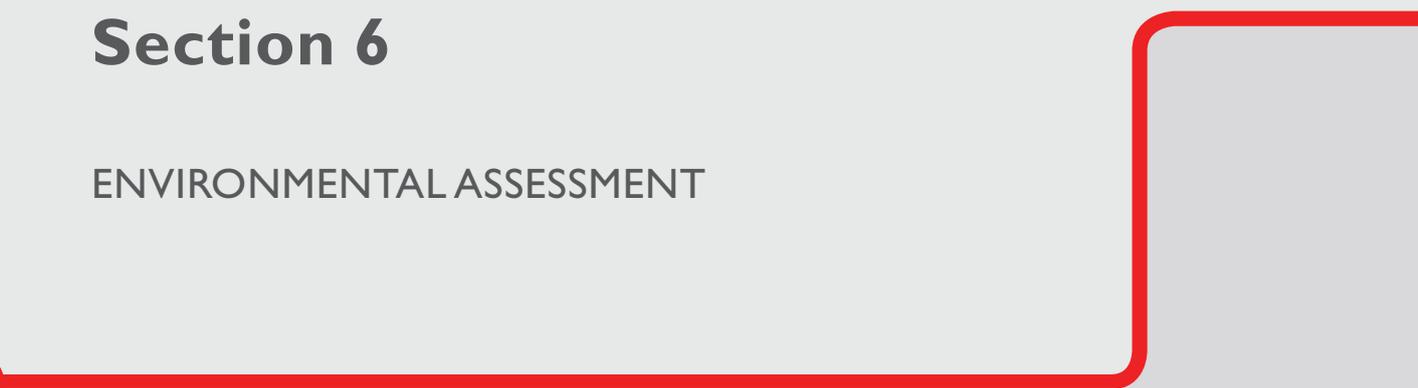
*Ref #	Address	Consultation Details	Comments	Response/EA Section Reference
			Blue quarry or the Jandra quarry. R5 confirmed that they don't feel that noise or additional traffic would impact them. R5 was appreciative of the effort made to consult with them as it did not usually happen on other projects.	
R6	1677 The Lakes Way, Rainbow Flat	Contacted by phone and introduced the proposed modification. R6 advised that they weren't interested in meeting with Holcim but would appreciate further information on the proposed intensification in production to be provided by email. The BSD was emailed to R6 on 13 May 2014.		Noted
R7	136 Spicers Road, Rainbow Flat	Contacted by phone and introduced the proposed modification. Invited to the meeting with other Spicers Road residents on 5 June 2014.	R7 indicated that their house occasionally shakes during a blast. Holcim committed to communicate blasting assessment results to R7.	Noted
R11	15174 Pacific Highway, Possum Brush	Proposed intensification in production introduced to R11. R11 advised that they are not interested in being consulted with.		Noted
R17	155 Spicers Road, Rainbow Flat	Contacted by phone and introduced the proposed modification. A meeting was held at R17 with various other neighbours on 5 June 2014.	R17 advised that they had no reason to object to the proposed intensification in production. R17 noted that they were unhappy that the original development consent obtained by the Jandra quarry prevented the subdivision of their property. R17 also had the following queries/comments: 1. Is there a requirement to notify the Civil Aviation Authority (CAA) prior to blasting to prevent potential impacts on light aircraft? 2. What was Holcim's long term plans for the expansion of the quarry once the resources,	1. Holcim confirmed that there is not currently a requirement to notify the CAA and this had not been raised as an issue by DP&E; and 2. Holcim advised that the current plan would be to rehabilitate the

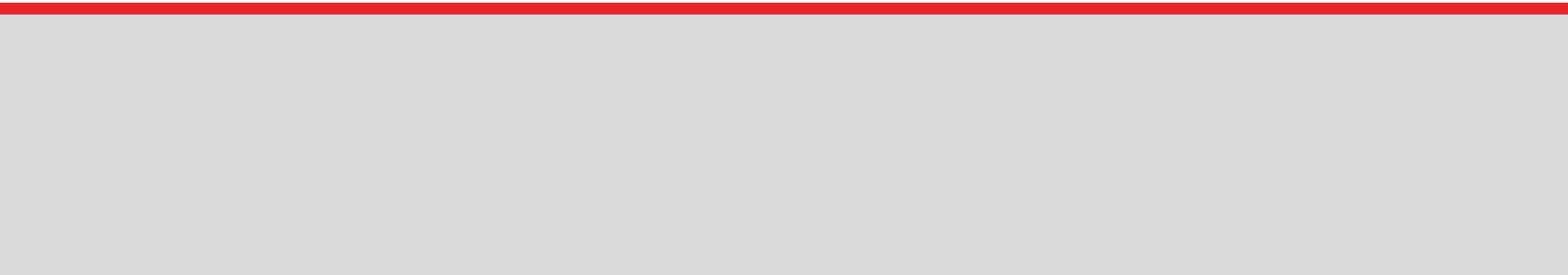
*Ref #	Address	Consultation Details	Comments	Response/EA Section Reference
			approved for extraction are exhausted? 3. Why aren't competitor quarries supplying the large Pacific Highway upgrade projects to the north?	quarry; and 3. Refer to Section 3.1.
R18	131 Spicers Road, Rainbow Flat	R18 attended the meeting at R17 with various other neighbours on 5 June 2014.	R18 did not raise any particular concerns about the proposed intensification in production.	Noted
R19	117 Winmurra Drive, Rainbow Flat	A number of efforts were made by Holcim to contact R19 and various messages were left for R19 to contact Holcim if they were interested to hear more about the proposed intensification in production.	No response back from R19.	Noted
R20	152 Spicers Road, Rainbow Flat	Contacted by phone and introduced the proposed modification. R20 attended the meeting at R17 with various other neighbours on 5 June 2014.	R20 advised that they had no reason to object to the proposed intensification in production. R20 were also unhappy that the original development consent obtained by the Jandra quarry prevented the subdivision of their property. R20 noted that a recent blast caused the windows in the house to rattle.	Impacts of the proposed intensification in production on noise and blasting are presented in Section 6.3.

Note: The reference numbers for residential receivers have been aligned with those used for the air quality and noise and blasting impact assessments. R8 - R10 are Holcim owned residences, while R12 - R16 are located at a distance from the Jandra quarry (on the other side of the Pacific Highway to the south west), whereby they would be unlikely to be impacted by the activities associated with the proposed intensification in production.

Section 6

ENVIRONMENTAL ASSESSMENT





6 ENVIRONMENTAL ASSESSMENT

6.1 Identification of Potential Environmental Impact

A preliminary environmental risk analysis was undertaken on commencement of the environmental assessment process to identify the key potential environmental issues or impacts associated with the proposed modification. The results of the preliminary environmental risk analysis were presented in the Background Scoping Document that was submitted to and accepted by the Department of Planning and Environment in March 2014. For those environmental issues that achieved a high or medium risk rating, further assessment has been undertaken in the form of specialist technical investigations (refer to Sections 6.2 - 6.8 and Appendix B - H).

For those environmental issues that achieved a low risk rating in the preliminary environmental risk analysis, further specialist technical investigations are not considered necessary. The proposed modification will not result in any additional impacts on these low risk environmental issues than what has already been assessed in the 1999 EIS and subsequent approved modifications, as these non-key issues could largely be addressed using existing environmental safeguards and management measures.

Table 11 provides a summary of all of the environmental and social issues that have been considered in the environmental assessment of the proposed intensification in production and provides reference to the section of the EA in which these issues have been addressed.

Table 11: Environmental and Community Issues

Issue	EA Reference
Traffic and Transport	Section 6.2
Noise and Blasting	Section 6.3
Air Quality	Section 6.4
Surface Water Management	Section 6.5
Flora and Fauna	Section 6.6
Heritage	Section 6.7
Greenhouse Gases	Section 6.8
Socio Economic	Section 6.9
Flooding and Groundwater	Section 6.10
Land Contamination	Section 6.11
Visual Amenity	Section 6.12
Rehabilitation and Closure	Section 6.13

Note: The proposed study area for the modification as presented in Figure 5 includes the:

- Approved disturbance area; and
- New disturbance area associated with the proposed heavy vehicle access road and expansion of the existing finished product stockpile area.

6.2 Traffic and Transport

The proposal will require up to a maximum of 24 heavy vehicle movements per hour (12 loads) through the existing Jandra Quarry Access Road - Pacific Highway intersection during peak production.

Transport and Urban Planning undertook a Traffic Impact Assessment (Appendix B) in accordance with the *RTA Guide to Traffic Generating Developments 2002*, to assess the traffic impacts associated with the proposal.

6.2.1 Existing Traffic Conditions

Pacific Highway

The principal road that provides access to Jandra Quarry is the Pacific Highway. The Pacific Highway is a State Road and National Route under the control of Roads and Maritime. The Pacific Highway, in the section between Bulahdelah and north of Taree, is a high standard four lane divided road with a dual carriageway.

In the section of the Pacific Highway immediately north of the Jandra Quarry Access Road intersection, the vertical alignment of the highway has a relatively steep up grade for a distance of approximately 1.5 kilometres, followed by a down grade north of this point. South of the Jandra Quarry Access Road the highway is constructed around a sweeping left hand bend on a relatively flat grade. In the southbound carriageway, a left turn entry loop road into a rest area, is located approximately 650 metres south of the Jandra Quarry Access Road.

The speed limit on the Pacific Highway in the vicinity of the Pacific Highway - Jandra Quarry Access Road intersection is 110km/h.

Pacific Highway / Jandra Quarry Access Road Intersection

The Jandra Quarry Access Road is a minor road, which forms a 'T' junction intersection with the Pacific Highway and provides an exclusive access to the Pacific Highway *i.e.* it is not shared with public road users and unauthorised access is controlled by a boom gate. The Jandra Quarry - Pacific Highway intersection is a standard seagull configuration (refer to **Figure 9**) comprising the following:

- A 130 metre long right turn bay including taper in the southern approach of the Pacific Highway for vehicles turning right into Jandra Quarry Access Road;
- A 250 metre long right turn acceleration lane with a seagull channelisation for vehicles turning right out of the site to travel north;
- A 190 metre long left turn deceleration lane including taper in the northern approach of the Pacific Highway for vehicles turning left into Jandra Quarry Access Road;
- Separate road carriageways with two through lanes northbound and two through lanes southbound;
- Priority control on the Jandra Quarry Access Road; and

- Intersection warning signs in both approaches of the Pacific Highway.

The sight distance for vehicles turning out of Jandra Quarry Access Road is estimated to be 380 metres to the north and 200 metres to the south. The sight distance to the north meets Austroad requirements of 282 metres, for Safe Intersection Sight Distance, for 110km/h roads. While the sight distance to the south is less than this, this is not critical as the northbound acceleration lane at the intersection allows vehicles turning right out of Jandra Quarry Access Road to join the Pacific Highway in its own acceleration lane, which is separated from the northbound through traffic lanes. The acceleration lane also allows vehicles turning right out of the site, to accelerate to a speed where they can merge safely with northbound through vehicles. Right turning heavy vehicles normally enter the acceleration lane and then when suitable gaps appear in the north bound traffic, change lanes into the adjacent through lane and then into the kerbside or left through lane.

Existing Traffic Volumes

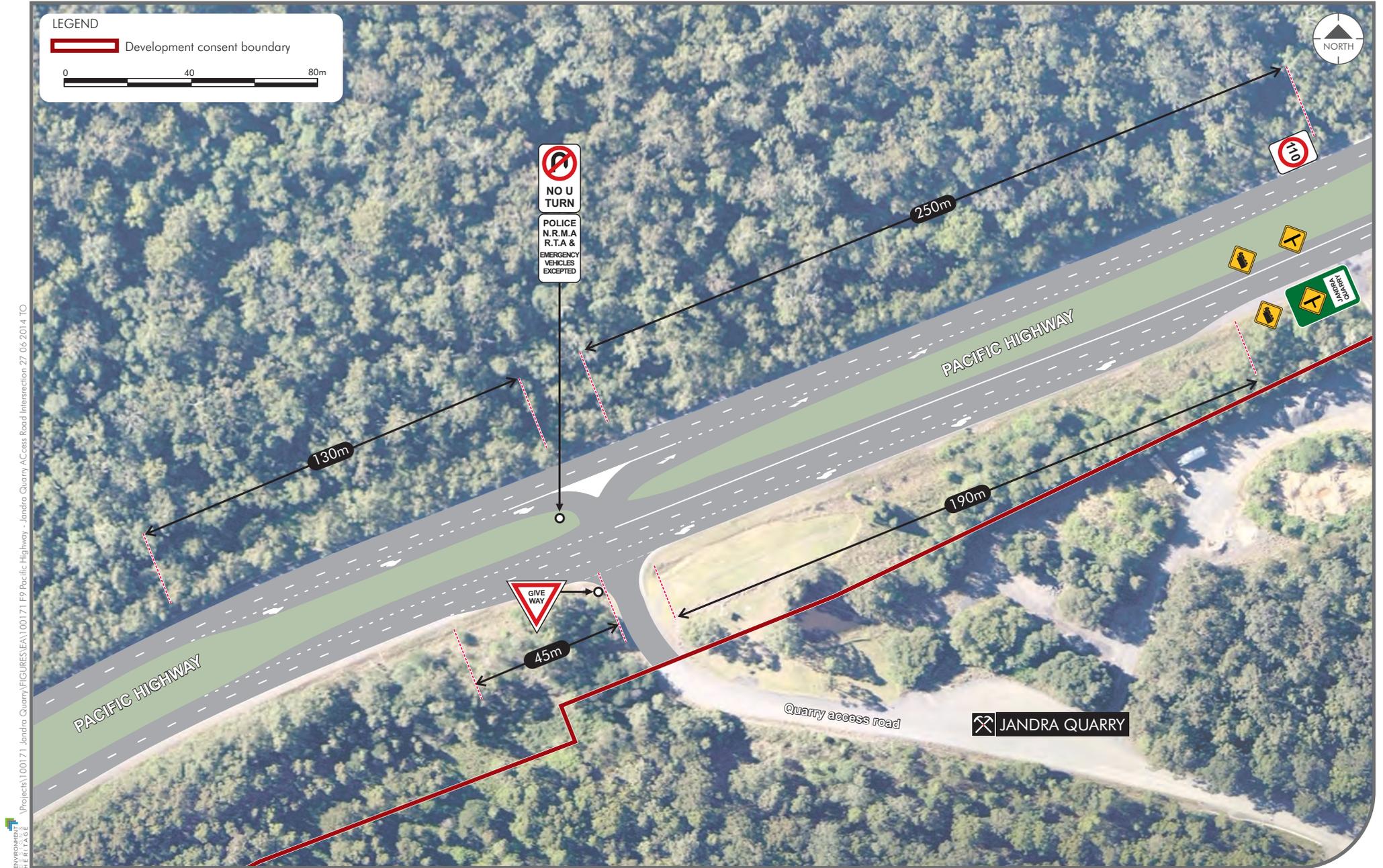
Traffic counts on the Pacific Highway and at the Jandra Quarry Access Road intersection, were undertaken in May 2011, to establish the existing traffic conditions on the local road network. This included daily volume and vehicle classification counts in the Pacific Highway, as well as peak hour turning volumes at the Jandra Quarry Access Road intersection. The 2011 traffic count data is appropriate for use in the traffic impact assessment as:

- The count data is only just 3 years old. When Roads and Maritime were still publishing Average Annual Daily Traffic (AADT) volume data for state roads, this was always 2-3 years old, when first published. The count data that was used was a little over 2 years old when the traffic assessment commenced. It is therefore considered that the traffic count data used is not out of date;
- The traffic counts are consistent with the most recent AADT volumes published by Roads and Maritime, which are for 2012;
- There has been no major changes to the land use in the area that would substantially alter the base traffic volumes collected for the highway or the quarry;
- While the highway upgrade works to the south around Bulahdelah have been completed, they are unlikely to have changed / increased the usage of the Pacific Highway adjacent the quarry. The highway has always been the fastest and most attractive road route in the area for traffic travelling between Newcastle and Taree and the coastal communities in-between. The recent upgrade works to the south would not have seen traffic transferring from other routes such as the Lakes Way; and
- There has been no change to the quarry's operation and traffic generation since 2011.

A summary of the traffic volumes on the Pacific Highway and at the Pacific Highway - Jandra Quarry Access Road intersection, are presented in Section 3.3 of the Traffic Impact Assessment report.

The existing traffic generation at Jandra Quarry varies considerably from day to day, as well as by each hour during the day, based on sales, load sizes² and required delivery times. Typically the busiest hours occur in the mornings, with deliveries tapering off in the afternoon.

² The average finished quarry product truck loads recorded for the 12 month period (September 2012 to September 2013) was 29 tonnes.



ENVIRONMENTAL HERITAGE
 PROJECTS\100171 Jandra Quarry\FIGURES\EA\100171 F9 Pacific Highway - Jandra Quarry Access Road Intersection 27.06.2014 TO



PACIFIC HIGHWAY - JANDRA QUARRY ACCESS ROAD INTERSECTION

Environmental Assessment
 Jandra Quarry
 Possum Brush, New South Wales 2430

Design Source: Transport and Urban Planning (2014)

FIGURE 9

The existing quarry operation generates the following vehicle movements per 12 hour day (6am - 6pm):

- Up to 60 light vehicle movements (employees and visitors) per day (30 inbound trips and 30 outbound trips);
- 58 heavy vehicle movements per day, on an average day (29 inbound trips and 29 outbound trips); or
- 110 heavy vehicle movements per day, on a busy day (55 inbound trips and 55 outbound trips).

The quarry currently generates the following heavy vehicle movements per hour:

- 10 heavy vehicle movements per hour, on an average hour (five inbound trips and five outbound trips);
- 16 heavy vehicle movements per hour, on a busy hour (eight inbound trips and eight outbound trips); or
- 24 heavy vehicle movements per hour, on a maximum hour (12 inbound trips and 12 outbound trips). A maximum hour occurs when full loading capacity is used *i.e.* one heavy transportation vehicle every five minutes.

The markets for quarry products are located both north and south of the Jandra Quarry. Historical traffic volumes have been split approximately 60 percent to the south towards Bulahdelah and 40 percent to the north towards Taree, while over more recent years this split has changed to 50:50.

Road Safety

Road crash statistics were provided by Roads and Maritime for the section of the Pacific Highway between Wallambah Road Nabic and the Lakes Way at Rainbow Flat / Purfleet, for the period between 1 July 2010 and 11 December 2013 (refer to Section 3.4 of the Traffic Impact Assessment Report for further detail on road crash statistics on the Pacific Highway).

On this section of the Pacific Highway, which covers a distance of 15km, there were a total of 69 crashes, with 21 injury crashes including two fatal crashes. There were no crashes at the Jandra Quarry Access Road - Pacific Highway intersection.

A review of crashes indicates that there is no particular pattern to the crashes and or the locations, although Roads and Maritime identified excessive speed and or fatigue as factors in 38 of the crashes.

6.2.2 Impact Assessment

Predicted Traffic Generated by Intensification in Production

The future traffic generation at Jandra Quarry during intensified production will vary considerably from day to day, as well as by each hour during the day, based on sales, load sizes and required delivery times. Typically the busiest hours will continue to occur in the mornings with deliveries tapering off in the afternoon.

The principal transport route will continue to be the Pacific Highway north and south of the Jandra Quarry Access Road. In general, the traffic assignment split between north and south for finished quarry product trucks is expected to remain approximately 50:50, although this may vary on some days.

As outlined in Section 3.5.7, the workforce is expected to increase by six employees taking the total number of full time employees to 20.

At full production of 475,000 tonnes per calendar year, assuming average truckloads of 29 tonnes (same as existing loads) and transportation of finished quarry products 300 days per year, Jandra Quarry is expected to generate the following vehicle movements per 16 hour day:

- 80 light vehicle movements per day (40 inbound trips and 40 outbound trips);
- 110 heavy vehicle movements per day, on an average day (55 inbound trips and 55 outbound trips); or
- 186 heavy vehicle movements per day, on a busy³ day (93 inbound trips and 93 outbound trips).

While the quarry is expected to generate the following heavy vehicle movements per hour:

- 14 heavy vehicle movements per hour, on an average hour (seven inbound trips and seven outbound trips);
- 20 heavy vehicle movements per hour, on a busy hour (10 inbound trips and 10 outbound trips); or
- 24 heavy vehicle movements per hour, on a maximum hour (12 inbound trips and 12 outbound trips). A maximum hour occurs when full loading capacity is used *i.e.* one heavy transportation vehicle every five minutes.

Traffic impacts are typically assessed for the busiest hour or peak hours associated with traffic generation during intensified operations. Table 12 outlines the increase in hourly heavy vehicle movements and trips associated with the proposal.

Table 12: Increase in Hourly Heavy Vehicle Movements and Trips

	Existing Approval 250,000 tonnes per calendar year		Project 475,000 tonnes per calendar year		Difference	
	Loads	Trips	Loads	Trips	Loads	Trips
Average Hour	5	10	7	14	+2	+4
Busy Hour	8	16	10	20	+2	+4
Maximum Hour	12	24	12	24	Nil	Nil

The proposed intensification in production is predicted to increase hourly heavy vehicle transportation by up to:

- Four heavy vehicle movements per hour, on an average hour (two inbound trips and two outbound trips); and
- Four heavy vehicle movements per hour, on a busy hour (two inbound trips and two outbound trips).

There will be no increase in the maximum hour, as the quarry only has the capacity to load 12 truck and dog combination vehicles per hour and currently does load at this rate at times of very high demand.

³ Representative of the 85th percentile day.

For an average weekday, the additional daily traffic generation from the proposal is estimated to be:

- 20 light vehicle movements per hour (10 inbound trips and 10 outbound trips); and
- 52 heavy vehicle movements per day (26 inbound trips and 26 outbound trips).

This equates to an increase of 36 vehicles on the Pacific Highway on the average weekday.

The predicted increase in total traffic volumes on the Pacific Highway, north and south of the Jandra Quarry, associated with the proposal would be 0.3%. Heavy vehicles represent 29.2% of total traffic volumes using the Pacific Highway. The proportional increase in heavy vehicles using the Pacific Highway due to the proposal would be approximately 0.1% for an average weekday.

Intersection Performance

The most significant impact would occur at the Pacific Highway - Jandra Quarry Access Road intersection during a maximum hour when 12 heavy vehicles enter and exit the quarry access road (*i.e.* 12 trucks in and 12 trucks out).

Depending on sales on a particular day, this could result in the following hourly scenarios:

1. 6 trucks travelling north, together with 6 return trips and 6 trucks travelling south together with the 6 return trips (*i.e.* normal 50:50 split north and south);
2. 12 trucks travelling north, together with the 12 return trips (*i.e.* 100% split to north); and
3. 12 trucks travelling south, together with the 12 return trips (*i.e.* 100% split to south).

To examine the impacts of the maximum hour, during intensified production, on the Pacific Highway - Jandra Quarry Access Road intersection, traffic modelling has been undertaken using the SIDRA software package. SIDRA assesses the operational performance of intersections under traffic signal, roundabout or sign control. The best criteria for assessing intersections controlled by sign control (as is the case at the Pacific Highway - Jandra Quarry Access Road intersection) are Level of Service (LoS), Degree of Saturation (DoS) and Average Vehicle Delay (AVD). LoS criteria for intersections is outlined in the *RTA Guide to Traffic Generating Developments 2002* (refer to Table 4.3 in Section 4.3 of the Traffic Impact Assessment). The desirable design criteria for intersections is a LoS D or better, with LoS A being 'good operation' and LoS F being 'oversaturated, requires other control mode'.

The traffic modelling results (refer to Table 4.4 in Section 4.3 of the Traffic Impact Assessment) show that the intersection would operate at a similar LoS during intensified operations as it does under existing conditions. The intersection is predicted to operate at LoS A (good operation) during the AM, Business hours and PM peak periods, with low vehicle delays for all turning movements into and out of Jandra Quarry Access Road.

To examine the alternative scenarios where 100% of the heavy vehicles are despatched either to the north and / or to the south in a maximum hour, additional traffic modelling has been undertaken for the business peak hour volumes, which generally are representative of the highest overall traffic volumes using the Pacific Highway in any one hour. The results of the traffic modelling (refer to Table 4.5 in Section 4.3 of the Traffic Impact Assessment) for the alternative scenarios described above, show that with both the alternative scenarios, the intersection would retain a LoS A (good operation) with low vehicle delays for all turning movements into and out of Jandra Quarry Access Road.

The traffic modelling confirms that the Pacific Highway - Jandra Quarry Access Road intersection would have considerable spare capacity with the proposal, with low vehicle delays and will continue to operate in a safe manner.

Intersection Geometry

The existing geometry of the Pacific Highway - Jandra Quarry Access Road intersection is presented in Figure 9 and described in Section 6.2.1.

The existing geometry has been assessed as being satisfactory in terms of intersection capacity and road safety requirements for the increased traffic associated with the proposed intensification in production. Irrespective of this, the geometry of the left and right turn movements out of the Jandra Quarry Access Road has been further considered, as these movements are of particular interest as trucks will be fully loaded when exiting the site.

Left Turn Out

The left turn out requires a safe gap in the southbound traffic on the Pacific Highway. Traffic modelling (refer to Tables 4.4 and 4.5 of Section 4.3 of the Traffic Impact Assessment) confirms that the delays to left turning vehicles, in the order of 8 - 13 seconds per vehicle in the weekday peak hours, are relatively low and that the existing traffic management for the left turn at the intersection is satisfactory.

The need for a left turn acceleration lane for vehicles turning left out of Jandra Quarry Access Road was examined as part of the Traffic Impact Assessment. However, the provision of a left turn acceleration lane is not favoured, due to the proximity of the Jandra Quarry Access Road and the southbound access road to the rest area, south of the site. The distance between these roads, at 650 metres, is considered too close to accommodate a left turn acceleration lane out of Jandra Quarry Access Road, given the potential conflicts between merging trucks and diverging vehicles, decelerating to enter the rest area.

Right Turn Out

A 250 metre long right turn acceleration lane (including taper) is provided in the northern carriageway of the Pacific Highway. This allows vehicles turning right out of Jandra Quarry Access Road to safely join the northbound carriageway in the Pacific Highway.

This acceleration lane is constructed on a reasonably flat grade, but at the end of the acceleration lane, the grade of the Pacific Highway changes with the commencement of a significant upgrade, which continues for approximately 1.5 kilometres to a crest, north of Blackbutt Road.

The acceleration lane length allows light vehicles exiting the quarry to accelerate to a speed where they can merge safely with northbound through vehicles. Right turning heavy vehicles normally enter the acceleration lane and then when suitable gaps appear in the north bound traffic flow, they change lanes into the adjacent through lane and then into the kerbside / left through lane. The heavy vehicles change lanes as quickly as possible to the kerbside / left lane in the Pacific Highway, as when fully laden, their acceleration and vehicle speed is restricted by the upgrade, which continues for the next 1.5 kilometres. The light and heavy vehicle behaviour, when using the acceleration lane, has been observed on site and is effective.

The average weekday northbound hourly traffic volumes using the Pacific Highway in each lane at the Jandra Quarry Access Road intersection (refer to Table 4.6 of the Traffic Impact Assessment) show that:

- The highest hourly traffic volume using the right / median lane is 66 vehicles per hour (vph), which is equivalent to one vehicle every 55 seconds; and
- The hourly traffic volume using the left / kerbside lane during the busiest hourly periods number between 300 – 356 vehicles per hour (vph), which is the equivalent of one vehicle every 10 -12 seconds.

With intensified operations, up to 12 heavy vehicles may turn right out of the site during the maximum hour, although this figure for the right turn is likely to be lower than this at most times, typically numbering six trucks during the maximum hour. These volumes are the equivalent of one heavy vehicle every five minutes (12 loads per hour) or one heavy vehicle every 10 minutes (six loads per hour).

Austroroad guidelines state that the minimum gap in the adjacent lane for a vehicle to merge or change lanes is 3 seconds, with a follow up headway of 2 seconds for each additional vehicle also changing lanes. Laden heavy vehicles may require slightly larger gaps of 4 seconds in the adjoining traffic lane to merge or change lanes safely.

As demonstrated above, there are large regular gaps on the Pacific Highway between vehicles in the right / median lane (average of 55 seconds) and regular gaps between vehicles in the kerbside / left lane (10 - 12 seconds), which currently allows and will continue to allow, laden heavy vehicles, to safely merge / change lanes when travelling northbound.

After heavy vehicles change lanes into the kerbside / left lane, any following northbound vehicles in the kerbside lane, travelling at a higher speed than the truck, simply change lanes to the right/median lane to pass the truck.

The Traffic Impact Assessment examined the possibility of extending the length of the right turn acceleration lane northbound. However, it was concluded that extending the acceleration lane has no benefit, as truck speeds are and would continue to be affected by the existing up grade of the Pacific Highway, which continues for a distance of 1.5 kilometres, north of the end of the existing acceleration lane.

Field trials undertaken in March 2014, at the Pacific Highway - Jandra Quarry Access Road intersection, with a fully laden Holcim truck, show that the speed of the truck is the same at the top of the crest, as it is at the end of the existing acceleration lane. Truck speeds only increase after they pass the crest of the hill and proceed on the downhill section of the Pacific Highway, north of Blackbutt Road.

As outlined above, there are regular gaps in the northbound traffic flow in the Pacific Highway that allows product trucks to safely merge / change lanes, after turning right out of the site. The current arrangement, where product trucks turn right into the acceleration lane, change lanes into the right / median lane and then the kerbside / left lane, is safe and appropriate for the maximum traffic generation during intensified production and therefore, no changes are required to the length of the acceleration lane.

Future Traffic Conditions

Historical traffic growth on roads can be used as a guide to estimate likely future traffic growth. Examination of historic AADT volumes from two nearby traffic counting stations at Nabiac and Purfleet, revealed lineal average traffic growth of 4.1% and 3.3% per annum respectively.

Adopting these figures as a guide, lineal average traffic growth over the next 15 years or so could be expected to be in the order of 3% - 4% per annum on the Pacific Highway in the vicinity of Jandra Quarry.

Currently, the highest hourly volume in either direction (*i.e.* north or south) is less than 450 vph, which represents about 12.5% of the highway's theoretical capacity in each direction, based on an assumed capacity of 1,800 vph for each lane, or 3,600 vph for each carriageway. The Pacific Highway therefore has sufficient capacity to absorb future traffic growth, associated with regional population growth.

The maximum number of heavy vehicles generated by the Jandra Quarry will not change in the future, even with the intensification in production and would remain at 12 heavy vehicles arriving and 12 heavy vehicles departing the site during the maximum hour.

The Pacific Highway / Jandra Quarry Road Access intersection therefore has adequate capacity to safely cater for future traffic growth on the Pacific Highway for the foreseeable future.

Impact on Other Road Users

The proposed intensification in production is not expected to result in any negative impacts to other road users, including buses and school buses. School buses currently use the Pacific Highway in the morning and afternoon periods on school days. They co-exist with other vehicles using the Pacific Highway including heavy vehicles. Heavy vehicles generated by Jandra Quarry make up a relatively small proportion of the heavy vehicles using the Pacific Highway. The proposed intensification in production will only generate an additional four heavy vehicle movements per hour (*i.e.* two return truck trips per hour), which is unlikely to result in negative impacts on other road uses including school buses or cyclists.

School buses are highly visible and operate at times that would be known to Holcim's truck drivers and other local truck drivers, who deliver material sourced from the quarry.

6.2.3 Mitigation Measures

The traffic impact assessment has not identified the need for any further upgrades to the Pacific Highway – Jandra Quarry Access Road intersection. However, Holcim would continue with their driver awareness training for all staff at the Jandra Quarry, with a focus on the right turn movement out of the site and the correct use of the northbound acceleration lane.

6.3 Noise and Blasting

Hard rock extraction involves blasting and the use of large bulk earthwork machinery, which combined with processing equipment such as crushers, generate noise and vibration. The proposed intensification in production is likely to generate additional noise for longer periods of time than the current approved operations, which has the potential to have adverse impacts on surrounding residential receivers. The proposed changes to the approved operations that have the potential to result in noise and vibration impacts include:

- Extension of operating hours to include weekday evenings (6:00 am to 10:00 pm Monday to Friday) and from 6:00 am to 6:00 pm Saturday, including the return of trucks from Newcastle haul to midnight. Refuelling, servicing and maintenance will also be extended from 9:00 pm to 10:00 pm on Saturdays;
- Asphalt plant operating hours to allow for production on a 24 hour campaign basis;
- Addition of a mobile crusher within the quarry pit to increase processing capacity;
- Increasing blasting frequency from approximately one blast per month to approximately two blasts per month;
- Construction of a new heavy vehicle access road to separate inbound heavy vehicles from outbound heavy and light vehicles;
- Expansion of the finished product stockpile area;

SLR Consulting undertook a Noise and Blasting Impact Assessment (Appendix C) to assess the impacts on sensitive residential receivers, as a result of the proposed changes to the approved operations.

6.3.1 Existing Environment

Identified Sensitive Receivers

The Jandra Quarry is located within a rural area, which is generally characterised by low background noise levels, with scattered residences. The closest sensitive receivers surrounding the quarry are residences, located to the northeast (approximately 350 metres), east (approximately 850 metres), southeast (approximately 1.45 kilometres) and southwest (approximately 800 metres) of the operational areas of the site. Most of the residences to the southwest are located adjacent or in proximity to the Pacific Highway, which is a dominant noise source, at least during the day time. Receivers R1 to R10 (refer to Figure 4) are the closest receivers to the approved quarry operations. These receivers have therefore been selected to assess noise and blasting impacts associated with the proposed intensification in production.

Receivers R8, R9 and R10 are Holcim owned residences. Receiver R8 and R9 are located immediately south of the development consent boundary and R9 is unoccupied. R10 is located within the development consent boundary and falls within the eastern extent of the approved extraction area.

It is noted that the Environment Manager at Holcim confirmed that no environmental complaints relating to noise and blasting emissions at the Jandra Quarry were received during the period 1999 to 2014.

Existing Acoustical Environment

Unattended Continuous Noise Monitoring

Ambient noise monitoring surveys were undertaken at three residential locations (R1, R2 and R3) to assist in the determination of project specific criteria / noise limits and potential impacts associated with the proposal (refer to Table 14 in Section 5.1 of the Noise and Blasting Impact Assessment for a summary of the existing background and ambient noise levels measured at the monitoring locations). Ambient noise was not monitored at receptor locations R4 to R10. For assessment purposes, the existing acoustic environment at monitoring location R1 has been assumed to be representative of receiver locations R4, R5, R8 and R9 as these receivers are located within 600m of the Pacific Highway. R2 has been assumed to be representative of receiver locations R6, R7 and R10 as these receivers are remote from the Pacific Highway.

The noise logging data collected at R3, approximately 40 metres west of the Pacific Highway, has been used to quantify the existing ambient road traffic noise levels (refer to Table 15 in Section 5.1 of the Noise and Blasting Impact Assessment for a summary of the traffic noise levels recorded).

Operator-Attended Noise Surveys

Operator-attended noise surveys of 15 minutes duration were conducted at noise monitoring locations. During the attended noise surveys the operator identified the character and duration of acoustically significant ambient noise sources. Wherever possible, the operator quantified local traffic flows and made a qualitative assessment of the prevailing weather conditions (refer to Table 15 in Section 5.2 of the Noise and Blasting Impact Assessment for a summary of the operator-attended noise survey results).

6.3.2 Impact Assessment

All noise from quarry operations, including noise generated during construction of the proposed new heavy vehicle access road and the extension of the existing finished product stockpile area, is assessed as operational noise. As such, a specific construction noise assessment was not required for the proposal.

Acoustic Terminology

An explanation of noise level descriptors typically used for assessing the noise environment is provided in Section 3 of the Noise and Blasting Impact Assessment.

Project Specific Noise Emission Criteria

Operational Noise

The operational project specific noise criteria for the proposed intensification in production have been established in accordance with the Industrial Noise Policy (INP) using the procedure outlined in Section 4.1 of the Noise and Blasting Impact Assessment report (Appendix C).

The operational project specific noise criteria are presented in **bold** within Table 13.

Table 13: Project Specific Noise Criteria

Location	Period	Intrusiveness Criteria LAeq(15minute) (dBA)	EPA Acceptable Amenity Criteria LAeq(Period) (dBA)	Project Specific Noise Criteria LAeq(15minute) (dBA)
R1, R4, R5, R8 and R9	Day	41	50	41
	Evening	43	45	41¹
	Night (6 am to 7 am)	41	40	40
R2, R6, R7 and R10	Day	39	50	39
	Evening	38	45	38
	Night (6 am to 7 am)	47	40	38²
R3	Day	55	51	51
	Evening	53	52	51 ¹
	Night (6 am to 7 am)	53	50	50

Source: SLR, 2014.

(1) Adjustment made in accordance with the INP Application Notes.

(2) The evening limit has been adopted for these locations due to anomalies in the night time data collected at R2.

Off Site Road Traffic

Existing road traffic noise levels exceed the Road Noise Policy (RNP) assessment criteria at R3 and can be expected to exceed the identified limits at other residences within 40 metres of the highway.

Due to the existing exceedance, the road traffic noise impacts of the quarry intensification have been assessed by comparing the predicted change in traffic noise with the threshold criteria of +2dBA.

Sleep Disturbance

The sleep disturbance noise emission design goals presented in Table 14 have been based on the minimum noise level recorded during the night period at each monitoring location.

Table 14: Sleep Disturbance Design Goals

Location	LA90(15min) RBL (dBA)	Sleep Disturbance Noise Emission Design Goal (LA1(1 min)) (dBA) ¹
R1, R4, R5, R8 and R9	36	51
R2, R6, R7 & R10	33 ²	48
R3	48	63

Source: SLR, 2014.

Blast Emissions

Design goals for blast emissions at all identified sensitive receiver locations are provided in Table 15.

Table 15: Blast Emission Limits

Attribute	Recommended Maximum Level	Comments
Airblast	115 dBL(peak)	The level of 115 dBL may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 120 dBL at any time.
Ground vibration	5 mm/s peak particle velocity (ppv)	The ppv level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

Source: SLR, 2014

Noise Modelling

In order to determine the acoustical impact of the proposal, a computer model incorporating all significant noise sources, the closest potentially affected residential receivers, and the intervening terrain has been prepared.

The computer model was prepared using the SoundPLAN V7.2 Industrial Module, which allows the use of various internationally recognised noise prediction algorithms. The CONCAWE algorithm, which is suitable for the assessment of large industrial plants, has been selected for this assessment because it also enables meteorological influences to be assessed.

Inputs to the computer model included meteorological information, sound power levels of plant and equipment and operational scenarios involving the identified stages to the quarry development (refer to Section 7 of the Noise and Blasting Impact Assessment for further information on all inputs to the computer model).

Predicted Operational Noise Impacts

Operational noise from the proposal has been assessed against the project INP criteria for the three stages of the quarry development. Predicted noise levels have been calculated with and without asphalt production in progress, as asphalt production will not be a regular part of routine operations at Jandra Quarry. Detailed modelling results are presented in Section 8 of the Noise and Blasting Impact Assessment and are summarised in the following sections.

Stage 1

Normal Operations - No Asphalt Production

Predicted noise levels were above the project criteria at R10 (Holcim owned residence) during the day / evening period and R1, R5 and R10 under worst case propagation conditions during the morning shoulder period.

Restricted Morning Shoulder Operations - No Asphalt Production

Noise levels were therefore recalculated at receiver locations with restricted operations during the morning shoulder period (6 am to 7 am) in an attempt to eliminate exceedances of the project criteria during Stage 1. Restricted operations involve:

- No works in the approved overburden emplacement area;
- No works above RL50; and
- No operation of the mobile processing plant.

With restricted morning shoulder operations, compliance with the project criteria is predicted at all private residences.

Normal Operations and Asphalt Production

The predicted noise levels are up to 7 dBA above the project criteria at R1 during normal operations including asphalt production. Compliance with the project criteria is predicted at all other private residences, provided that operations are restricted during the early morning shoulder period.

Stage 2

Normal Operations - No Asphalt Production

Predicted noise levels were above the project criteria at R1 and R10 (Holcim owned residence) during the day / evening period, and R1, R5, R6 and R10 under worst case propagation conditions during the morning shoulder period.

Restricted Morning Shoulder Operations - No Asphalt Production

Noise levels were therefore recalculated at receiver locations with restricted operations during the morning shoulder period in an attempt to eliminate exceedances of the project criteria during Stage 2. Restricted operations involve:

- No works in the approved overburden emplacement area;
- No works above RL50; and
- No operation of the mobile processing plant.

With restricted morning shoulder operations, compliance with the project criteria is predicted at all private residences with the exception of R1. Calculated noise levels are 5 dBA above the criteria at R1 during the day / evening period.

Normal Operations and Asphalt Production

The predicted noise levels are up to 7 dBA above the project criteria at R1 during normal operations including asphalt production. Compliance with the project criteria is predicted at all other private residences, provided that operations are restricted during the early morning shoulder period.

Stage 3

The Holcim owned residence R10 will be demolished at the end of Stage 2 (at the latest) as it is located within the eastern extent of the approved extraction area. Noise levels have therefore not been predicted at receiver R10 for Stage 3 of the quarry development.

Normal Operations - No Asphalt Production

Predicted noise levels were above the project criteria at R1, R2 and R6 during the day / evening period, and R1, R2, R6 and R7 under worst case propagation conditions during the morning shoulder period.

Restricted Morning Shoulder and Day / Evening Operations - No Asphalt Production

Noise levels were therefore recalculated at receiver locations assuming no work at or above RL74 during the day / evening period and with restricted operations during the morning shoulder period, in an attempt to eliminate exceedances of the project criteria during Stage 3. Restricted operations involve:

- No works in the approved overburden emplacement area;
- No works above RL50; and
- No operation of the mobile processing plant.

With restricted morning shoulder and day / evening operations, compliance with the project criteria is predicted at all private residences with the exception of R1. The recalculated day / evening noise levels, demonstrate that noise levels predicted for R2 and R6 during normal operations without asphalt production, are due to works on the uppermost benches of the quarry and are unlikely to occur during works below RL74. However even with these restricted operations, noise levels at R1 are predicted to exceed the project criteria during the day / evening period.

Calculated noise levels are 4 dBA above the project criteria at R1 during the day / evening period.

Normal Operations and Asphalt Production

The predicted noise levels are up to 7 dBA above the project criteria during the day / evening period and up to 6 dBA above the project criteria during the morning shoulder and night periods at R1 during normal operations including asphalt production. Predicted noise levels at R2 and R6 are 2 dBA above the day / evening project criteria due to normal quarry works at RL74 and above, rather than due to the operation of the asphalt plant. Compliance with the project criteria is predicted at all other residences provided that operations are restricted during the early morning shoulder period.

Summary of Predicted Operational Noise Impacts

Restricted Operations - No Asphalt Production

Compliance with the early morning shoulder project criteria is predicted at all receiver locations and for all stages of the quarry life, provided that operations are restricted during this time and the asphalt plant is not in production. Restricted early morning shoulder operations involve:

- No works in the approved overburden emplacement area;
- No works above RL50; and
- No operation of the mobile processing plant.

For the day / evening period:

- During Stage 1, compliance with the project criteria is predicted at all private receivers;
- During Stage 2, compliance with the project criteria is predicted at all private receivers apart from R1; and
- During Stage 3, compliance is predicted at all private receivers apart from R1, R2 and R6. The predicted noise levels at R2 and R6 are above the criteria by a marginal amount (2 dBA) and are predicted to occur whilst works are at or above RL74. Works at lower benches are predicted to comply with the project daytime criteria at R2 and R6.

Normal Operations - Including Asphalt Production

Noise from asphalt production predominantly affects R1 and R10 (Holcim owned residence) during all stages of the quarry development, as these receptor locations have a line of sight to the asphalt plant. The predicted levels at R1 are up to 7 dBA above the project criteria during normal operations with asphalt production.

Off Site Road Traffic Noise Impacts

The future change in road traffic noise levels associated with the proposal has been calculated to be a maximum of:

- 0.3 dBA during the day period; and
- 1.9 dBA during the night period.

The changes are below the threshold criteria of +2 dBA and therefore no further investigations or controls have been considered.

Sleep Disturbance

Noise generated during the early morning shoulder period and during night time operation of the asphalt plant, has the potential to cause sleep disturbance.

Noise levels are predicted to be 1 dBA and 4 dBA above the project sleep disturbance criteria at R1 and R10 (Holcim owned residence) respectively during worst case meteorological conditions. The noise levels are predicted to occur at R1 during works on the upper southern and eastern benches of the quarry (at or above RL74) during Stages 2 and 3, and at R10 during operation of the primary processing plant during all stages.

These noise levels will not occur at the private receiver R1 if the recommended operational restrictions for the early morning shoulder periods are implemented. The predicted noise levels at R10 (Holcim owned residence), while above the INP sleep disturbance criteria, are well below the 60 to 65 dBA (external) sleep disturbance levels identified in the *Road Noise Policy*.

Blasting Impacts

The existing method of material extraction from the quarry pit is by drill and blast techniques incorporating free-face blasting (refer to Section 8.4.1 of the Noise and Blasting Assessment for a summary of indicative blast design details). As discussed in Section 5.2, the Maximum Instantaneous Charge (MIC) is typically 75 kilograms, as each hole will usually be initiated separately. In some cases two holes are initiated simultaneously resulting in a MIC of approximately 137 kilograms.

The calculated MIC that allows the ANZEC Guidelines⁴ for human comfort to be met at the closest private receivers are outlined in Table 16. All Holcim owned residences will be evacuated during blasting in accordance with the Jandra Quarry blast management procedure and were therefore not considered in the blasting assessment.

Table 16: Highest acceptable MIC (kg) to meet ANZEC Guidelines for human comfort

Stage	Bench	Closest receiver	Distance from blast (m)	Highest Acceptable MIC (kg) determined from:		Maximum acceptable MIC (kg)
				Ground Vibration	Ground Vibration	
1	North	R1	750	300	400	300
	South	R3	960	500	900	500
	East	R1	700	270	350	270
2	North	R1	570	180	185	180
	South	R1	650	240	280	240
	East	R1	640	230	260	230
3	North	R1	500	140	125	125
	South	R2	730	300	380	300
	East	R1	550	170	160	160

Source: SLR, 2014.

Holcim do not usually use MICs greater than 137 kg at Jandra Quarry. As such, compliance with the guidelines is predicted at all receptor locations, for all blasts and at all stages of the quarry life, apart from R1 during Stage 3. Blasts on the northern benches during this stage of the quarry expansion should be restricted to a MIC of less than 125 kg.

Provided that the guidelines in Table 15 are met:

- The predicted levels of ground vibration at all nearby residences will comply with the ANZEC general human comfort criteria (of 5 mm/s) and consequently with the BS 7385 structural damage criterion of 15 mm/s (at 4 Hz);
- The predicted levels of peak airblast at all residences will comply with the ANZEC general human comfort criteria of 115 dB Linear; and
- The predicted levels of peak airblast will be well below the US Bureau of Mines damage limit of 132 dB Linear (2 Hz cut off) at all residences.

Notwithstanding the above, it is recommended that all blasts are monitored at the closest / potentially most affected residence in order to establish compliance with the nominated criteria and to progressively update the blast emissions site laws (ground vibration and airblast) in order to optimise future blast designs, based on actual site conditions. In this way, the site laws can be used to assist with the blast designs in order to ensure compliance with the ANZEC criteria at all nearby residences.

By adopting this approach, in conjunction with the inevitable future introduction of improved blasting products, it is anticipated that the blast emissions criteria can be met without imposing any unnecessary constraints on the blast designs throughout the life of the quarry.

6.3.3 Mitigation Measures

The following recommendations are provided for managing noise and blasting emissions during intensified operations. These are in addition to the existing noise and blast

⁴ Australian and New Zealand Environment Council (ANZEC), *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*, September 1990.

management controls outlined in the Jandra Quarry Environmental Management Plan that would still be relevant with the proposed intensification in production.

Day / Evening Operations (excluding asphalt production)

Noise levels from quarry operations that are 5 dBA above the day / evening project criteria, which are not directly attributable to the asphalt plant, are predicted at R1 during Stages 2 and 3. These noise levels are due to works at or above RL74 in the southern and eastern part of the quarry pit.

Noise levels from quarry operations that are a marginal 2 dBA above the day / evening project criteria, which are associated with works at or above RL74 in the southern and eastern part of the quarry pit, are predicted at R2 and R6 during Stage 3.

The predicted day / evening noise levels at R1, R2 and R6 fall inside the INP Noise Management Zone⁵. As such the following management procedures may be investigated as an alternative to noise mitigation.

- Prompt response to any community issues of concern;
- Noise monitoring on site and within the community;
- Refinement of on-site noise mitigation measures and plant operating procedures where practical;
- Consideration of acoustical mitigation at receivers; and
- Consideration of negotiated agreements with property holders.

Whilst the predicted noise levels do not meet the INP intrusiveness criteria, they are below the 45 dBA amenity criteria at R2 and R6, and marginally (1 dBA) above the amenity criteria at R1.

Holcim will discuss the predicted noise levels with the property holders, and attempt to negotiate an agreement. This approach is considered appropriate given that the predicted noise levels are not greater than 5 dBA above the project criteria and are only predicted to occur during the day / evening, when works are at or above RL74, in the southern and eastern extents of the pit, during Stages 2 and 3.

Holcim would also limit works at or above RL74, in the southern and eastern extents of the pit, during Stages 2 and 3, to the day time. Works would not be undertaken in this area during the evening period.

Early Morning Shoulder Period

Holcim would implement the following restrictions to quarry operations during the early morning shoulder period in order to comply with the project criteria for all stages of the quarry development:

- No works in the quarry pit above RL 50;
- No dumping or redistribution of overburden in the approved overburden emplacement area;
- No operation of the mobile processing plant.

⁵ The INP Noise Management Zone is where the project specific criteria are exceeded by between 1 dBA to 5 dBA resulting in noise impacts ranging from negligible to moderate.

Asphalt Plant

Noise from operation of the asphalt plant during campaigns is predicted to affect R1 and R10 (Holcim owned residence), with noise levels of up to 7 dBA above the project criteria predicted at R1. Holcim will pursue a negotiated agreement with the property holder of R1. If an agreement could not be negotiated with R1, compliance with the criteria could be achieved by constructing a noise barrier immediately east of the asphalt plant. The extent and height and location of the barrier can be determined during detailed noise control design.

On Site Residence (R10)

Compliance with the project noise and vibration criteria is not readily achieved at receiver R10. This is a Holcim owned residence and acceptance of exposure to noise above the criteria would be a condition of occupancy. R10 is located within the footprint of the Stage 3 extraction area. Prior to the extraction area reaching R10, this resident's lease agreement will be terminated and the residence will be demolished.

Blast Emissions

Blasting only takes place between 9:00 am and 5:00 pm Monday to Friday and between 9:00 am and 3:00 pm Saturday (as is current practice), with no blasting on Sundays and public holidays.

Occupants of Holcim owned residences would be evacuated during blasts in accordance with the Jandra Quarry blast management procedure.

To control ground borne vibration and airblast to privately owned receivers, the MIC for blasts would not exceed the calculated MICs outlined in Table 16 that allows the blasting criteria to be met at the nearest receiver to all blasting locations. The MIC used on the northern benches during Stage 3 would be restricted to no greater than 125 kg in order meet the blasting criteria at the nearest receiver R1.

Other

Broadband Reversing Beepers

To minimise noise intrusion due to source tonality, it is recommended that broadband 'quacker' type reversing beepers are used on all site vehicles operated in the approved overburden emplacement area, and on the upper southern and eastern benches during Stages 2 and 3 as a minimum, but preferably during all stages of the quarry development.

Approved Operating Hours

Management would restrict the operations to the approved operating hours and would ensure staff are made aware of these hours as part of their training.

Noise and Blasting Monitoring

Blasts would continue to be monitored at the closest non-Holcim residence (in accordance with condition 45 of DA231-10-99 and the requirements of EPL 2796) in order to establish compliance with the blasting criteria and to progressively update the blast emissions site laws. As per EPL 2796 requirements, all blast monitoring results will be published to the Holcim Australia company website.

The levels of noise emitted from the quarry operations would continue to be monitored at the closest non-Holcim residence (in accordance with the condition 44 of DA231-10-99 and the requirements of EPL 2796) in order to establish compliance with the noise criteria.

6.4 Air Quality

Hard rock extraction involves blasting and the use of large bulk earthwork machinery, which combined with processing equipment such as crushers and the hauling of material by truck on unsealed roads, generate dust. The proposal will result in an increase in blasting frequency, extended operating hours, the addition of a mobile crusher and increased truck movements. This intensification in production is likely to generate additional dust per unit time and for longer periods of time than the current approved operations.

The proposal includes operating a mobile asphalt plant 24 hours a day on a campaign basis. Asphalt plants generate emissions as well as odour that have the potential to impact on nearby sensitive receivers. During consultation with the community surrounding the Jandra Quarry, receiver R2 raised concern over the odour that they had experienced during historical asphalt production campaigns.

SLR Consulting undertook an Air Quality Impact Assessment (Appendix D) to assess the impacts of the proposal on the local air quality.

6.4.1 Existing Environment

Emissions from the existing quarry operations consist mainly of particulate matter, which will be generated from a range of quarry activities, including drilling and blasting and the handling and transport of overburden / topsoil materials, shot rock and finished products. Wind erosion of disturbed areas and stockpiles / processing areas also has the potential to generate dust emissions under dry, windy conditions. Emissions of pollutants from quarrying machinery and vehicle exhausts are of an insignificant nature.

The existing air quality in the area immediately surrounding the Jandra Quarry is influenced by a number of factors including traffic and agricultural activities. Holcim monitor the dust deposition rate at a number of locations surrounding the site. The locations of the monitoring sites are presented in Figure 4.

Ambient monitoring data for particulate matter (PM_{2.5}, PM₁₀ and TSP) were not available for the period of modelling. Review of available dust deposition data from Holcim monitoring locations indicate that dust deposition in the local area is well below the relevant OEH guideline. However, analysis of this data reveals inconsistency in the monitoring period. The monitoring period varies from 20 days to 87 days. Due to this inconsistency with the Australian Standard (30 days ±2 days), the recorded data was considered unreliable and has therefore not been used in this assessment.

In absence of any reliable site representative ambient monitoring and dust deposition data, available ambient monitoring data recorded within the region was analysed to establish the regional background level for this assessment. Based on the analysis of the available monitoring data (refer to Section 5 of the Air Quality Impact Assessment report), the Aberdeen monitoring site data was considered to be most suitable for this assessment.

It is noted that the ambient PM₁₀ concentrations in the vicinity of the Jandra Quarry are likely to be lower than that measured at the Aberdeen site, as the monitoring data is highly likely to be influenced to some degree by the following activities:

- Use of wood heaters in the Aberdeen area;

- Intense agricultural activities in the vicinity of the monitoring site; and
- Mining activities within the Upper Hunter region.

Therefore, use of monitoring data recorded at the Aberdeen monitoring site is likely to overestimate the background particulate environment when compared with areas surrounding the Jandra Quarry operations and therefore the assessment is considered to be conservative.

Estimated Background Particulate Level

Ambient monitoring data for PM_{2.5} and TSP was not available from any of the regional monitoring sites considered. Background PM_{2.5} and TSP concentrations were therefore estimated using the PM_{2.5}/PM₁₀ and PM₁₀/TSP ratio based on the data collected in the vicinity of coal mines and presented in the Australian Coal Review (Richardson 2000). The data showed that an average of 40% of TSP was found to consist of particles in the size range of PM₁₀ and only 4% of TSP (or equivalently 10% of PM₁₀) was found to consist of particles in the size range of PM_{2.5}. Estimated background particulate concentrations used to assess the cumulative impact are presented in Table 17.

It is noted that the ratios are related to coal mining operations but in the absence of ratios related to hard rock quarry operations, the approach is considered to be appropriate.

Table 17: Estimated Background Particulate Levels

Pollutant	Averaging Period	Data (µg/m ³)
Particulate Matter as PM _{2.5} ¹	24-Hours	Daily varying
	Annual	1.8
Particulate Matter as PM ₁₀	24-Hours	Daily varying
	Annual	18.3
Total Suspended Particulate Matter (TSP) ²	Annual	46

Source: SLR, 2014.

(1) Estimated assuming a PM_{2.5}/PM₁₀ ratio of 0.1

(2) Estimated assuming a PM₁₀/TSP ratio of 0.4

No reliable dust deposition data is available to estimate the background level for the local area. Therefore, assessment of the cumulative dust deposition rate has not been included in this assessment. The predicted incremental dust deposition rate is compared with the relevant OEH guideline for incremental (proposal only) dust deposition rate of 2 mg/m²/month to assess compliance.

6.4.2 Impact Assessment

Pollutants of Interest

The main emissions from the intensification in production will be particulate matter, as is the case from the existing operations. From a human health and nuisance perspective, particles are classified primarily by size, as TSP (total suspended particulates), PM₁₀ (particulate matter with an aerodynamic diameter up to 10 µm) and PM_{2.5} (particulate matter with an aerodynamic diameter up to 2.5 µm). Human health effects of dust tend to be associated with particles with an aerodynamic diameter of 10 µm or less (≤ PM₁₀). Emissions of TSP have the potential to result in nuisance impacts due to increased rates of dust deposition in the surrounding area.

Other potential pollutants that will be emitted as a result of the proposal include products of fuel combustion from the on-site vehicles and mobile / fixed equipment. Given the small scale of these emissions and the relative distances between the Jandra Quarry and nearby sensitive receivers, the proposal would not be expected to result in a significant increase in ambient concentrations of these pollutants at surrounding sensitive receivers and therefore have not been quantitatively assessed in the Air Quality Impact Assessment.

The only potential source of odour associated with the proposal is the mobile asphalt plant. The asphalt plant is proposed to operate 24 hours per day on a campaign basis, primarily to cater for night road works.

Air Quality Criteria

The air quality criteria adopted for use in the assessment of fugitive particulate emissions and odour from the operational activities are summarised in Table 18. These criteria are applicable to cumulative impacts, i.e. the total exposure level including background.

Table 18: Criteria for Fugitive Particulate Emissions and Odour

Pollutant	Averaging Period	Criteria	Source
Particulate Matter as PM ₁₀	24-Hours	50 µg/m ³	NSW OEH
	Annual	30 µg/m ³	NSW OEH
Particulate Matter as PM _{2.5}	24-Hours	25 µg/m ³	NEPM
	Annual	8 µg/m ³	NEPM
Total Suspended Particulate Matter (TSP)	Annual	90 µg/m ³	NSW OEH
Dust Deposition ^{1,2}	Annual	2 g/m ² /month	NSW OEH
Odour ³	Nose response	2 OU	NSW OEH

Source: SLR, 2014.

(3) Dust is assessed as insoluble solids as defined by AS 3580.10.1-1991.

(4) Note that 2 g/m²/month relates to the incremental contribution to dust deposition from the proposal. Cumulative levels are not to exceed 4 g/m²/month.

(5) The odour criteria of 2 OU is the most stringent applicable in NSW and would ensure minimal impact on the most sensitive of populations.

Emission Estimation

Emission Factors

Potential particulate emissions from the Stage 1, Stage 2 and Stage 3 quarry operations were estimated based on the emission factors presented in the latest *Emission Estimation Technique Manual for Mining* (hereafter, "EETMM"), *Version 3.1* (Environment Australia, 2012) and USEPA AP42 documents (refer to Section 6 of the Air Quality Impact Assessment report for details of the emission factor / equations used in estimating the potential emissions).

Activity Data and Assumptions

Assumptions were made on the types of activities that are likely to take place simultaneously during all stages of the quarry development including operational controls (refer to Tables 4 and 5 in Section 6.3 of the Air Quality Impact Assessment report, for the activity data and operational controls considered in estimating potential particulate emissions from the proposed activities for each stage).

Estimated Particulate Emissions

Emissions from each stage of the quarry development were estimated based on the assumed activity data, relevant emission factors and existing and proposed mitigation measures (refer to Tables 5, 6 and 7 in Section 6.3 of the Air Quality Impact Assessment report, for the estimated emissions for each stage of the quarry development).

It is noted that a number of activities including stripping topsoil and overburden with the bulldozer, maintaining haul roads with the grader, overburden transport by trucks and spreading overburden within the overburden emplacement area with the bulldozer, would occur on a campaign basis for a relatively short period of time (<3% of the year). These activities are unlikely to make any significant contribution in the predicted long term (annual) average impact, however may contribute significantly in elevating the short term (24-hour) average impact. To account for the contribution from these activities, potential daily maximum emission rates were also estimated and used for predicting the short term impact from the proposal on surrounding sensitive receivers.

Atmospheric Dispersion Modelling

Emissions from each stage of the quarry development have been modelled using a combination of the TAPM, CALMET and CALPUFF models (refer to Section 7 of the Air Quality Impact Assessment report, for further detail on the atmospheric dispersion modelling methodology).

Steady-state models like AUSPLUME assume that meteorology is unchanged by topography over the modelling domain and may result in significant over or under estimation of air quality impacts. The CALPUFF dispersion model has the ability to handle three dimensional meteorology as well as calm wind speeds (<0.5 m/s) and therefore was considered to be appropriate for this assessment.

More advanced dispersion models (such as CALPUFF) are approved for use by many regulatory authorities in situations where these models may be more appropriate than use of steady-state models and assumptions.

Predicted Particulate Impacts

The predicted concentrations of PM_{2.5}, PM₁₀, TSP and dust deposition rates at the nearest sensitive receivers are outlined below for each stage of the quarry development.

PM_{2.5} Concentrations

The maximum 24-hour and annual average incremental (proposal only) and cumulative PM_{2.5} concentrations were predicted at the identified sensitive receivers for each stage modelled (refer to Table 11 in Section 8 of the Air Quality Impact Assessment report).

The predicted maximum 24-hour and annual average cumulative PM_{2.5} concentrations are below the relevant ambient air quality criteria at each identified sensitive receiver for each stage of the quarry development.

Contour plots of the incremental maximum 24-hour and annual average PM_{2.5} concentrations for each stage of the quarry development are presented in Appendix A of the Air Quality Impact Assessment report.

PM₁₀ Concentrations

The maximum 24-hour and annual average incremental and cumulative PM₁₀ concentrations were predicted at the identified sensitive receptors for each stage modelled (refer to Table 12 in Section 8 of the Air Quality Impact Assessment report).

The predicted maximum 24-hour and annual average cumulative PM₁₀ concentrations are below the relevant ambient air quality criteria at each identified privately owned sensitive receiver for each stage of the quarry development.

Although the predicted maximum 24-hour and annual average cumulative PM₁₀ concentrations are below the relevant ambient air quality criteria at each identified privately owned sensitive receiver, a contemporaneous⁶ analysis was undertaken of the predicted maximum 24-hour average PM₁₀ concentrations at the privately owned receiver (R1) with the highest predicted PM₁₀ concentrations (refer to Table 13 in Section 8 of the Air Quality Impact Assessment report). The analysis showed that the predicted increment from the proposal is minimal (0.0 – 0.9 µg/m³) on the days with highest background concentration and that the predicted cumulative 24-hour average PM₁₀ concentrations comply with the relevant ambient air quality criteria.

A maximum of one day of exceedance of the 24-hour cumulative PM₁₀ criteria was predicted at Holcim owned receiver R9 (currently unoccupied) in Stage 1. A maximum of four days of exceedances of the 24-hour cumulative PM₁₀ criteria were predicted at Holcim owned receiver R10 in Stage 3 of the quarry development.

Contour plots of the incremental maximum 24-hour and annual average PM₁₀ concentrations for each stage of the quarry development are presented in Appendix A of the Air Quality Impact Assessment report.

TSP Concentrations

The annual average incremental and cumulative TSP concentrations were predicted at the identified sensitive receivers for each stage modelled (refer to Table 14 in Section 8 of the Air Quality Impact Assessment report).

The predicted cumulative annual average TSP concentrations are below the relevant ambient air quality criteria at each identified sensitive receiver for each stage of the quarry development.

Contour plots of the incremental annual average TSP concentrations for each stage of the quarry development are presented in Appendix A of the Air Quality Impact Assessment report.

Dust Deposition

The annual average incremental dust deposition rates were predicted at the identified sensitive receptors for each stage modelled (refer to Table 15 in Section 8 of the Air Quality Impact Assessment report).

The predicted incremental annual average dust deposition rates are below the relevant ambient air quality criteria at each identified sensitive receiver for each stage of the quarry development. As the predicted incremental dust deposition rate is below 0.1 mg/m²/month (2 g/m²/month is the incremental dust deposition criteria) at all identified sensitive receivers, the proposal is unlikely to elevate the dust deposition level significantly in the local area to cause any exceedance of the cumulative dust deposition criteria of 4 mg/m²/month.

⁶ Following the guidance provided in the “*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*” (DEC 2005) a contemporaneous analysis presents the cumulative impact for the five days with highest background PM₁₀ concentration and the five days with the highest predicted PM₁₀ increment for each stage of the project at the worst impacted privately owned receiver.

Contour plots of the incremental annual average dust deposition rates for each stage of the quarry development are presented in Appendix A of the Air Quality Impact Assessment report.

Predicted Odour Impacts

Continued operation of a mobile asphalt plant, 24 hours a day on a campaign basis, within the approved site facilities area, was identified as the only potential odour source at the site.

Potential odour emission from the asphalt plant was estimated based on stack testing data from the same type of mobile plant used on one of the proposed plant operator's sites in Gympie, Queensland (refer to Table 16 in the Air Quality Impact Assessment report for the stack parameters and odour emission rate representative of the mobile asphalt plant to be used on site). As the manufacturer of the mobile asphalt plants indicated that the stack height may vary from 5 meters to 16.5 meters, separate modelling was performed for each stack height.

Odour concentrations were predicted at the identified sensitive receivers (refer to Table 17 in Section 9 of the Air Quality Impact Assessment report) using a similar modelling methodology to predict particulate concentrations.

The predicted odour concentrations were $<0.1 \text{ OU}^7$ at all identified private sensitive receptors and $<0.2 \text{ OU}$ at all Holcim owned residences for both stack heights modelled. These predicted odour concentrations are well below the most stringent odour criteria of 2 OU.

The odour concentration modelling results identify that the proposed asphalt plant operation is unlikely to cause any odour nuisance at any surrounding sensitive receivers.

6.4.3 Mitigation Measures

Holcim will continue to undertake air quality management in accordance with the existing Jandra Quarry Environmental Management Plan required to be prepared to the satisfaction of the Director-General in accordance with Condition 12 of Schedule 2 of DA231-10-99. Air quality management controls implemented in accordance with the Environmental Management Plan include:

- Regular watering of haul roads and stockpiles;
- Limiting speeds of vehicles on unsealed surfaces to 40 kph;
- Minimising vehicle kilometres travelled on unpaved roads;
- Rehabilitating disturbed areas;
- Conduct drilling and blasting during suitable meteorological conditions (*i.e.* not during high winds);
- Drill holes capped with stemming to restrict the upward emission of dust;
- Dust extraction units on drill rigs and crushing / screening plants to be well maintained;
- Seals and mist sprays on crushing and screening plants to be well maintained; and
- Dust displaced during silo filling to be controlled by an appropriate filter (*i.e.* a reverse pulse silo filling filter or equivalent).

These existing air quality management measures as outlined in the Environmental Management Plan will be further refined and enhanced with the following controls:

⁷ Odour Unit: Predicted nose response odour concentration

- Level 1 watering (<2 l/m²/hr) of unsealed haul roads when dust is visible;
- Level 2 watering (>2 l/m²/hr) of the processing and stockpile area;
- Maintain the active pit and overburden emplacement area to the minimum size during all stages of the quarry development;
- Limit the speed of graders maintaining unsealed surfaces to 8 kph;
- Extraction of shot rock materials and stripping, hauling and emplacement of overburden would not be undertaken simultaneously; and
- Receiver R2 would be notified prior to the commencement of asphalt production campaigns, for the first year following asphalt production (post approval). This would provide receiver R2 with the opportunity to monitor odour during asphalt production and provide feedback to Holcim's Quarry Manager. This feedback would allow Holcim to consider whether further odour management controls are required, where reasonable and feasible.

Holcim will continue to implement the existing air quality monitoring program which comprises:

- Dust deposition gauges permanently placed along the four development consent boundaries and continuously monitored at monthly sample intervals; and
- Real-time monitors placed at the three closest sensitive receptors and monitored every three years.

6.5 Surface Water Management

The proposed intensification in production will increase the demand for process water. A Surface Water Management Assessment was undertaken by Storm Consulting (Appendix E) to review the existing stormwater management system at Jandra Quarry and its capacity to meet future process water demands and attenuate stormwater runoff including associated discharge.

The focus of this surface water management assessment has been to:

- Review water balance assumptions (supply and demand) for the site based on currently available data;
- Review the sizing of permanent stormwater / sediment basins to ensure they have been designed in accordance with current guidelines and best management practice; and
- To ensure all existing and proposed stormwater controls have sufficient capacity to accommodate the intensified operations, quarry development and associated site disturbance.

The NSW Department of Primary Industries, Office of Water (NoW) issued a letter to Element on 16 June 2014 with their environmental assessment requirements for the proposed intensification in production at Jandra Quarry (refer to Appendix A). NoW's assessment requirements are summarised in Section 5 and have been addressed in the Surface Water Management Assessment.

6.5.1 Existing Environment

Drainage

The site is located at the head of two minor tributaries of Talawahl Creek (refer to Figures 2 and 4). These minor tributaries (first order streams) flow northward, joining just before crossing the Pacific Highway after which they join another tributary that flows southwest to Talawahl Creek. Talawahl Creek is a tributary of Bungwahl Creek, which flows to the Wallamba River approximately 5.5 kilometres south of the site.

Main Dam and Pit Dam

The main existing stormwater basin (main dam) is located in the upper most section of the other minor ephemeral tributary (refer to Plate 5 and Figure 2). The majority of the surface water runoff from the active site areas drain to two main stormwater basins. Rainwater landing in the quarry is captured in the “pit dam” (refer to Plate 4), while the remainder of the active site drains into the main dam via a series of open channels and a gravity pit and pipe system. When the pit dam reaches capacity, water is gravity fed into the main dam.

The available volume of the main dam to the low flow outlet is approximately 10 ML and 10.9ML to the overflow spillway. The pit dam is approximately 100 metres long by approximately 33 metres wide and is approximately 14m deep at its deepest point, with a total volume of approximately 13 ML.

The main dam supplies the majority of the sites water requirements with the exception of drinking water, which is purchased from a potable supply. Water is withdrawn from the main dam for use in the crushing and screening plant, wheel wash and dust control. After use, water is reticulated back into the main dam.

The discharge⁸ of water from the main dam is regulated by and is required to comply with the requirements of EPL 2796. The discharge point where water monitoring is undertaken is identified in Figure 4.

‘Clean Water’ Dam

The existing development consent approved a license for extraction of an additional 5ML per annum from the ‘clean water’ dam located in an undeveloped part of the property; approximately 100 metres to the northeast of the main dam (refer to Figure 2).

Overburden Emplacement Area

The overburden emplacement area is completely bunded, and effectively functions as an enclosed sedimentation basin for collection of stormwater runoff generated from disturbed areas within the emplacement area. All stormwater runoff collects within the bunded area and slowly infiltrates through the unsealed basin floor over time.

Wash Off Water

Water applied in the processing plant for dust suppression drains to a stormwater sump at a low point in the processing area. Collected water is pumped to two small sedimentation basins adjacent to the pit dam. The basins provide primary sedimentation treatment for silted water and discharges by gravity to the main dam via a vegetated Macrophyte treatment area.

⁸ Discharge from the main stormwater basin only occurs during significant rainfall events.

A weighbridge and wheel wash system is located on the main access road to the north west of the main dam. The wheel wash system is activated by a sensor and cycles for 15 minutes, cleaning sediment and dust from all vehicles leaving the site. Water drains to a sump beneath the wheel wash system and when triggered by a level sensor a pump transfers water from the sump to the north western corner of the main dam.

Fuel Oil Storage Area

Appropriate fuel storage and spill control is necessary for preventing the discharge of hydrocarbons into dams and downstream waterways. Existing site controls partition fuel storage areas from other areas of the site and reduce the risk of stormwater contamination as a result of fuel spills.

The fuel / oil storage area is covered by a roofed structure to limit the entry of rainfall and is designed with bunds to contain any oil or fuel spills, preventing discharge from the site. The floor of the storage area is sloped to a sump with a gate valve outlet. Any liquid that collects in the sump is removed periodically by an approved maintenance contractor.

Existing Soil and Water Management Plan

A Soil and Water Management Plan (SWMP) was developed for Jandra Quarry to comply with conditions of consent. It was developed to:

- Ensure adequate water supplies under most climatic conditions; and
- Safeguard the integrity of downstream watercourses.

Overall the water management measures, and erosion and sediment controls proposed in the SWMP have formed the basis of the current surface water management system.

Effective control of erosion and sediment movement at the site is currently achieved by the following measures:

- Drainage of surface water runoff from disturbed areas into sedimentation basins (main dam and pit dam);
- Diversion of clean water from undisturbed areas around working areas;
- Minimisation of disturbed areas;
- Collection of wash off water and primary treatment systems;
- Temporary erosion and sediment controls prior to commencement of topsoil and overburden removal;
- Sequential clearing and rehabilitation of the quarry as extraction of material proceeds; and
- Twice yearly maintenance of erosion and sediment control structures to ensure their efficiency.

Heavy Vehicle Access Road and Expanded Finished Product Stockpile Area

The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area are all located in the vicinity of the upper most section of one of the minor ephemeral tributaries of Talawahl creek. The majority of the proposed new disturbance area is well vegetated with a mixture of primarily native canopy and groundcover species.

6.5.2 Impact Assessment

Stormwater / Sediment Basin Capacity

The function of the site sedimentation basins is to catch all stormwater runoff from the disturbed areas within the site, and to minimise the concentration of fines in overflow waters.

Future quarry operations will involve the relocation and resizing of the existing sedimentation basin (pit dam) within the main quarry. The pit dam, during Stages 1, 2 and 3, will be a combined sedimentation basin and sump. The area of the quarry will gradually increase as the extraction area extends to the east (refer to staging plans - Figures 6, 7 and 8). The pit dam will be progressively enlarged to ensure it has capacity to control sediment from the maximum extent of the extraction area. The floor of the quarry pit will be graded to ensure a fall is maintained towards the pit dam.

Design Criteria

The volumetric requirements for the sediment basins required to accommodate stormwater runoff from Stages 1, 2 and 3 of the quarry development, were determined by following the procedures detailed in Chapter 6 of *Managing Urban Stormwater - Soils and Construction Volume 1* (DECC 2004) and *Volume 2E: Mines and Quarries* (DECC 2008).

The design of the sediment basins needs to provide sufficient storage capacity for quarry operational water demands including dust suppression, process needs and rehabilitation requirements. Sediment basins and associated erosion control measures in mines and quarries are required to cater for the 1 in 20 year average recurrence interval (ARI) peak flow (refer Table 6.1, *Blue Book - Volume 2E - Mine sand Quarries*, DECC 2008).

Volume Requirements

The volumetric requirements for the sediment basins required to accommodate stormwater runoff from Stages 1, 2 and 3 of the quarry development are outlined in Section 3.1.2 of the Surface Water Management Assessment.

The calculated sediment basin requirements indicate that the existing sediment basins (main dam and pit dam) have sufficient volume.

The current storage requirement for the quarry area is 6.3 ML, which is less than 50% of the capacity of the existing pit dam. The configuration of the pit dam will change with each stage of quarry development (refer to the indicative sediment basin plans in Appendix C of the Surface Water Management Assessment), however the location of the pit dam is likely to be at the western end of the extraction area. The pit dam would need to store a maximum volume of 13.7 ML at the start of Stage 3 of the quarry development.

The main dam, at a capacity of 10 ML, does not require relocation or upgrading to meet the storage requirements throughout all stages of the quarry development.

Stormwater / Sediment Basin Management

Water Quality

Previous soil testing undertaken for the Jandra Quarry EIS (ERM 1999), indicated that site soils range from slightly to highly dispersive and there is a potential for fine dispersible soils to be suspended in stormwater runoff.

A review of water quality monitoring results provided for the period 1/04/2012 - 06/03/2014 (refer to the Section 3.1.3 of the Surface Water Management Assessment), indicate that there have been exceedances of the EPL concentration limits for Total Suspended Solids

(TSS) and that measured pH levels remain within EPL limits. An improvement in the operation and maintenance of site erosion and sediment controls, including the main dam, is likely required to improve discharge water quality. Flocculation of the main dam is required to settle out the suspended solids if water quality cannot be improved by alternative measures. If the monitoring results indicate a sustained exceedance trend, an artificial flocculation program should be investigated and if implemented, carried out in accordance with the guidelines shown in *Managing Urban Stormwater - Soils and Construction Volume 1 - Appendix E*, (DECC, 2004) (refer to Appendix E of the Surface Water Management Assessment).

Site Water Balance

Water Demands

Potable water for personal consumption is purchased.

Non-potable water demands during existing and intensified quarry operations include:

- **Employees use:** Non-potable water required for toilet flushing and hand basin use is supplied from rainwater tanks that harvest roof water from the buildings in the maintenance area. The rainwater supply is backed up by a mains water top up system;
- **Process Water:** Water is used in the processing plant for dust suppression. It is applied in the form of fine mist sprays;
- **Dust Suppression:** All haul roads are sprayed by water cart at least 4 - 5 times a day. Finished product stockpiles are fitted with a sprinkler system, which is turned on when required. A water cart is also used with a spray cannon for those finished product stockpiles that are not covered by a sprinkler system. The water requirements for dust suppression are the largest of all site water demands. Dust suppression demands accounted for in the water balance model have been calibrated to generally align with historical metered data. The volumes of water required for dust suppression will vary with each stage of quarry development and the prevailing weather conditions;
- **Product Moisture:** Certain types of material such as road bases and other road pavement materials are required to have a moisture content of around 7%. Quarried material is basically dry and water is added to these products during processing;
- **Truck and Wheel Washing Facilities:** Trucks and plant used in quarry operations are cleaned as part of general maintenance and prior to servicing. Water used in vehicle washing is treated to remove coarse grit and oil before being recycled back into the quarry water system by discharging to the main dam; and
- **Environmental losses:** Water is lost to the environment from the main dam and pit dam via evaporation and infiltration.

Annual water demands estimated for the water balance model (refer to Section 4.1 of the Surface Water Management Assessment for a summary of annual water demands for key quarry stages) have been calibrated using historical data from the water meter on the transfer pump, located next to the main dam.

Water Balance Model

A daily water balance model has been developed to simulate the water cycle of the quarry. The model has been used to compare operational water demands, with the volume of stormwater runoff generated and stored within the quarry site. The objective of the model was to determine the magnitude of either water surplus or deficit at various stages of quarry development under varying climatic conditions. Simulated water requirements have been based on the demands outlined above.

Water supply has been determined using historical rainfall and evaporation data to estimate runoff into the dams (refer to Section 4.2 of the Surface Water Management Assessment for a summary of rainfall and evaporation data used in the water balance model).

Catchment areas have been delineated using aerial photography and topographical data. Runoff coefficients were estimated for each catchment.

A sensitivity analysis was undertaken to enable assessment of the quarry's water balance at various stages of development and under various climatic conditions. The following scenarios were modelled:

- Current and proposed Stages 1, 2, and 3 of quarry development;
- Dry, Average, and Wet years.

The pit dam storage was modelled with a capacity of 13 ML under current conditions and 13.7 ML (the minimum sedimentation basin volume required in Stage 3) for Stages 1 - 3. The main dam storage capacity (10 ML) was modelled as static for all stages of quarry development (refer to Section 4.2.5 of the Surface Water Management Assessment for a summary of the various assumptions made around the characteristics and management of the site sediment basins).

Water Balance Model Results

The model was used to prepare estimates of the following:

- Daily and annual runoff from the dam catchments;
- Monthly and annual demands;
- Any overflows / spills from the dams; and
- Any deficits or top up requirements for the quarry's water supply.

Table 19 provides a summary of results from the sensitivity analysis undertaken using the water balance model (refer to Appendix D of the Surface Water Management Assessment for full water balance results).

Table 19: Water Balance Results for Various Stages of Quarry Development

Summary Results	Current			Stage 1		
	Dry Year	Mean Year	Wet Year	Dry Year	Mean Year	Wet Year
Total Runoff (ML/yr)	35	98	165	34	97	164
Total Demands (ML/yr) ⁹	25.60	24.88	24.11	36.60	35.64	34.63
Stormwater Supplied (ML/yr) ¹⁰	25.46	24.88	24.11	32.13	35.45	34.63
Total Storage Top Up (ML/yr)	0.13	0.00	0.00	4.46	0.19	0.00
% Demand Met	99%	100%	100%	88%	99%	100%
Spill Volume (ML/yr)	4	68	131	3	57	112

⁹ Total Demands = Volume of water pumped from main dam to supply site demands + environmental losses (main dam only)

¹⁰ Volume of water that can be supplied from the main dam

Summary Results	Stage 2			Stage 3		
	Dry Year	Mean Year	Wet Year	Dry Year	Mean Year	Wet Year
Total Runoff (ML/yr)	39	110	186	45	129	219
Total Demands (ML/yr)	36.42	35.47	34.46	34.60	33.74	32.82
Stormwater Supplied (ML/yr)	32.32	35.34	34.46	31.85	33.74	32.82
Total Storage Top Up (ML/yr)	4.09	0.13	0.00	2.75	0.00	0.00
% Demand Met	89%	100%	100%	92%	100%	100%
Spill Volume (ML/yr)	4	70	139	9	90	174

The models results show that the site storage is capable of satisfying the quarry's current water demands under the climatic conditions considered. Overflows will occur from the main dam under dry, average and wet rainfall conditions.

During Stages 1, 2 and 3 of the quarry development water shortages may occur in extreme dry conditions (5th percentile year) for up to a month if maximum production and water use is maintained. Modelled water shortages occur when both the main dam and pit dam fall below 5% storage capacity. However, up to 5 ML per annum can be extracted from the clean water dam under the Part 2 license granted as part of the existing development consent for Jandra Quarry. This back up water source may be relied upon in the event of extended drought conditions and provides sufficient water to meet the expected deficit in non-potable water required. The conditions of the Part 2 license should be met prior to commencement of water extraction, which includes installation of a water meter at the offtake from the clean water dam.

It is also recommended that in the lead up to extended and extreme dry periods, water efficiency measures be implemented to prevent any restriction on production due to water shortages.

Dust suppression demands are the largest proportion of non-potable site demands and will increase during dry periods. Dust suppression watering demands have been conservatively estimated based on conventional quarry operations. Opportunities may exist to implement demand management measures via stabilisation of haul roads through applications of polymer or other chemical additives. Temporary stabilisation of road surfaces will reduce dust suppression watering requirements and can reduce the risk of water shortages during extended dry periods.

Increasing the pit dam storage can also improve stormwater harvesting yields during dry periods. The model results indicate that increasing the quarry pit dam to 25 ML will provide sufficient storage to buffer the water supply system during extended dry periods. The likelihood of an extended dry period (resembling a 5th percentile dry year) occurring is very low, in which case it may not justify the expense of creating a 25 ML storage volume within the quarry pit. To prevent significant loss of water from the pit dam through exfiltration, percolation tests should be undertaken when relocating the pit dam during Stages 1 - 3 of quarry development, in order to ascertain whether lining of the pit dam is required.

Approvals and Licences

In their environmental assessment requirements, NoW required consideration of the need for a controlled activity approval and / or a water extraction license. These requirements are discussed in the following sections.

Controlled Activity Approval

The new single lane heavy vehicle access road is proposed immediately adjacent to the main dam, with a section located within 40 metres of a first order watercourse.

The first section of the new heavy vehicle access road will be located on or at the base of the main dam wall.

Appropriate erosion and sediment controls will be implemented during the construction phase (refer to Section 6.5.3) to prevent erosion and sediment transport that has the potential to affect the downstream receiving environment.

Under provisions of the WM Act, a controlled activity approval is not required if the construction of an access track on waterfront land does not impound water and relates to a minor stream in a rural zone (NoW 2012). A controlled activity approval is therefore not required for the proposed heavy vehicle access road.

Harvestable Rights and Water Extraction License requirements

The Water Act is administered by NoW. Under the Act, a permit and / or license must be obtained to extract water not covered by a water sharing plan under the WM Act.

A license will be required under Part 2 of the Act if it is intended to extract water from the creek system or from dams with capacities above the harvestable rights dam capacity calculated by the NoW harvestable rights calculator as 13.2ML for the property (refer to the harvestable rights calculation in Appendix H of the Surface Water Management Assessment).

Under the WM Act, landholders have the right to capture and use 10 per cent of the average regional yearly rainfall runoff from their property. This is known as the harvestable right and corresponds to the maximum dam capacity for the property.

The harvestable rights dam capacity does not include '*dams for the capture, containment, and recirculation of drainage and / or effluent*' as outlined in *Dams in NSW - Do you need a license?* (NoW 2010). The pit dam and the main dam function primarily as dams for the capture and containment of drainage / runoff water for the purposes of water quality improvement and are considered as exempt from harvestable rights calculations.

The water balance prepared for this assessment identified that the main dam (sedimentation basin for the site facilities area) and the pit dam (sedimentation basin for the quarry pit) will satisfy anticipated water demands of the quarry for most climatic scenarios except in extreme dry conditions and the need for the extraction of water from the clean water dam in exceedance of the existing license threshold of 5 ML per annum is unlikely.

Heavy Vehicle Access Road and Expanded Finished Product Stockpile Area

The potential exists during construction of the first section of the new heavy vehicle access road (especially during heavy rainfall events), for the mobilisation of sediment and other pollutants in stormwater runoff and the deposition of this sediment in one of the minor ephemeral tributaries of Talawahl creek.

The expanded finished product stockpile area and the majority of the new heavy vehicle access road drain into the existing site facilities area, which drains into the main dam. Sediment laden surface water runoff would therefore not discharge directly into the watercourse downslope, during the construction of these sections of the proposed new infrastructure. The first section of the heavy vehicle access road is located on / at the base of the main dam wall. As this section of the proposed new infrastructure is located downstream of the main dam (main site sediment basin) appropriate construction erosion

and sediment controls are required to prevent the deposition of sediment in the downstream environment.

6.5.3 Mitigation Measures

The following surface water management measures would be implemented as a means to improve discharge quality from the site and are listed in order of priority:

- The outlet from the wheel wash system discharges in close proximity to the low flow outlet from the main dam. It is recommended that either:
 - A baffle (sediment curtain) be installed to lengthen the flow path of wheel wash water to the dam outlet or;
 - The wheel wash outlet should be moved further away from the main dam outlet to encourage greater drop out of sediment from wheel wash water and to reduce the risk of highly sediment laden wash off water from short-circuiting and discharging into the downstream waterway when the main dam is full and in bypass mode.
- Runoff from undisturbed catchments should be diverted around the quarry area prior to discharge into the dam;
- Disturbed sites prone to erosion (*i.e.* exposed earth batters around processing areas) should be stabilised with vegetation;
- Inspections of erosion and sediment controls should be undertaken on a regular basis and at least quarterly;
- Exposed earth channels and flow paths should be stabilised with vegetation where appropriate; and
- Should monitoring of Total Suspended Solids indicate levels in excess of 50mg/L, the main dam should be;
 - Treated with a flocculating agent immediately following any storm event large enough to cause runoff; and
 - Such dosing should occur within 24 hours of the conclusion of each storm event.

Heavy Vehicle Access Road and Expanded Finished Product Stockpile Area

Implementation of the surface water management measures outlined in the existing SWMP would prevent erosion and sedimentation impacts during the expansion of the finished product stockpile area and the construction of the majority of the heavy vehicle access road.

The following specific erosion and sediment controls would be implemented during the construction of the first section of the heavy vehicle access road, located on / at the base of the main dam wall:

- Construction should be timed where possible during low rainfall months of the year;
- A sediment fence would be erected within the watercourse, immediately downslope of the northernmost edge of the construction works, prior to ground disturbance; and
- Drainage structures (pipe or box culverts) to convey overflow from the main dam levy, under the heavy vehicle access road, would be constructed first, to allow clean water from the main dam to 'bypass' the construction works, preventing the mobilisation of unstabilised sediments during dam discharges.

6.6 Flora and Fauna

The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area (refer to Section 3.2.1 and 3.2.2), will be located on land that falls outside of the approved disturbance area. Construction of this new infrastructure will require vegetation clearing and ground disturbance, which has the potential to impact on threatened flora and fauna and / or ecological communities.

The proposed heavy vehicle access road will result in the removal of 0.25 hectares of vegetation (refer to Figure 5). This chosen route will follow the periphery of the cleared site facilities area and so minimise the requirement to remove and avoid fragmentation of the surrounding vegetation (refer to Plates 7 and 8). The vegetation to be removed is also subject to increased light and wind disturbance (edge effects) and weed penetration, due to it being adjacent to cleared lands and so represents lower quality habitat for fauna and flora.

The enlargement of the existing finished product stockpile area requires the removal of an additional 1.034 hectares of vegetation. The area to be cleared is located in the centre of the operating quarry (refer to Figure 5 and Plate 1), between the existing cleared site facilities area and the overburden emplacement area and so will again restrict the removal of native vegetation to that which is already fragmented from the surrounding habitat.

This new infrastructure, proposed to support the intensification in production, will therefore involve the clearing of a total of 1.284 hectares of native vegetation within the proposed new disturbance footprint.

The proposal also involves the extension of operating hours into the evening period as well as an increase in the number of vehicle movements associated with increased employees and delivery of greater volumes of finished quarry products. These intensified operations have the potential to impact on primarily threatened fauna that inhabit the bushland that surrounds the Jandra Quarry, with longer exposure to noise and lighting and increased risk of road-kill.

In order to fully understand the potential ecological impacts of the ground disturbance associated with the proposal, Niche Environment and Heritage were appointed to conduct a flora and fauna impact assessment (refer to Appendix E). The flora and fauna impact assessment involved:

- A literature review of relevant ecological assessments within and adjacent to the study area including:
 - Jandra Quarry Extension Environmental Impact Statement (ERM 1999);
 - Jandra Quarry Statement of Environmental Effects for Enlargement of an Overburden Emplacement Area (CSR Readymix 2002); and
 - Jandra Quarry Clarification of Production and Transportation Limits Environmental Assessment (Umwelt 2011);
- Relevant database searches of threatened flora and fauna species, populations and ecological communities within a 10km radius of the study area including:
 - OEH Atlas of NSW Wildlife (accessed February 2014);
 - OEH Threatened Species Database (accessed February 2014); and
 - EPBC Act Protected Matters Search Tool (accessed February 2014);
- A review of the scientific literature to provide information on the likely impacts of increased hours of activity of the quarry. This search attempted to identify studies that

indicated how fauna and flora respond to increased periods of noise and lighting and increased periods / levels of dust deposition;

- A site survey completed on 16 December 2013 and 7th February 2014 to undertake vegetation sampling and habitat assessment using field survey methods described in DEC (2004), Phillips and Callaghan 1995 and DECCW (2009). The methods used included:
 - BioMetric plots to describe and identify existing vegetation communities;
 - Habitat surveys for *Rhizanthella slateri* (Eastern Underground Orchid);
 - Targeted surveys for *Cryptostylis hunteriana* (Leafless Tongue-orchid);
 - Spot Assessment Technique (SAT) plots to document Koala activity;
 - Habitat assessment for threatened fauna and flora; and
 - Call playback (targeting the Koala) and spotlighting to locate and identify nocturnal fauna;
- All of the above tasks helped to determine threatened flora and fauna species, populations and ecological communities known or likely to occur within the study area;
- Seven part tests under Section 5A of the EP&A Act for relevant threatened species / communities with a moderate or higher likelihood of occurrence; and
- Identify appropriate adaptive management actions to avoid and mitigate impacts.

The study area referred to in this Section includes the disturbance footprint of the proposed new infrastructure outlined above and the immediate surrounds (refer to Figure 3 of the Flora and Fauna Impact Assessment).

6.6.1 Existing Environment

Literature Review

Findings of the literature review are summarised below.

Flora

Neither ERM (1999) nor CSR Readymix (2002) found any threatened flora species during previous surveys of the Jandra Quarry site.

Fauna

Two threatened fauna species were recorded within the development consent boundary: the Eastern Falsistrelle (*Falsistrellus tasmaniensis*) and the Grey-headed Flying Fox (*Pteropus poliocephalus*) (ERM 1999).

Another threatened fauna species was recorded within the development consent boundary: the Eastern Freetail-bat (*Mormopterus norfolkensis*) (CSR Readymix 2002).

Koala Surveys

Both ERM (1999) and CSR Readymix (2002) undertook Koala habitat assessments and concluded that land within the development consent boundary does not contain core Koala habitat. In both cases the consent authority concurred with the findings of the Koala habitat assessments.

Database Searches

The database search identified a total of 15 threatened flora species and 51 threatened fauna species that have previously been recorded within 10km of the study area (refer to

Table 2 in Section 3.1.2 of the Flora and Fauna Impact Assessment for a list of these species).

Seven additional species not previously recorded within the locality were included in the likelihood of occurrence analysis as the study area occurs within their natural range of distribution (refer to Table 3 in Section 3.1.2 of the Flora and Fauna Impact Assessment for a list of these species).

Site Survey

Flora

A total of 31 flora species were recorded in the BioMetric plot completed during the survey. The tree canopy consisted of *Eucalyptus microcorys*, *E. propinqua*, *E. siderophloia*, *E. acmenoides* and *Corymbia intermedia*. The midstorey was dominated by *Allocasuarina torulosa* and *Lophostemon confertus* and the groundstorey was dominated by *Lomandra longifolia*, *Themeda australis* and *Imperata cylindrica* (refer to Plate 8). A summary of the BioMetric data is included in Appendix 1 of the Flora and Fauna Impact Assessment.

Observations from random meander surveys conducted outside the BioMetric plot and within the study area indicate some variability in native vegetation cover. The vegetation within the finished product stockpile extension area and the heavy vehicle access road footprint is comparatively sparse comprising a greater compliment of sclerophyllous species. The canopy layer of this area is dominated by *Corymbia maculata*, *E. propinqua* and *E. siderophloia*. The vegetation located within the areas to be cleared represents a single unit and based on Hunter Biometric Vegetation Typing, this vegetation would be classified as Small-fruited Grey Gum - Tallowwood shrubby open forest on coastal foothills of the southern North Coast (HU 620).

Threatened Flora and Endangered Ecological Communities

During the two separate site visits undertaken between December 2013 and February 2014 targeted surveys were undertaken for threatened plants including the Leafless Tongue-orchid. The site survey's did not identify any Endangered Ecological Communities (EEC) or threatened flora species.

The threatened Eastern Underground Orchid could not be surveyed for as it is an underground species that can only be detected when it flowers between September and November (see further discussion on targeted surveys for the Eastern Underground Orchid in Sections 6.6.2 and 6.6.3).

Noxious Weeds

One noxious weed species, *Lantana camara*, listed on the NSW *Noxious Weeds Act 1992* was recorded within the study area. Lantana is listed as a Class 4 weed within the Greater Taree City Council and has the following regulatory direction:

'The growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed' NSW DPI (2014).

Fauna

A total of 12 fauna species were recorded during nocturnal surveys or opportunistically (refer to Table 4, Section 3.3 of the Flora and Fauna Impact Assessment for a list of all fauna species recorded on site).

Threatened Fauna

The Grey-headed Flying Fox (*Pteropus poliocephalus*) was the only threatened fauna species recorded within the study area. One fauna species was recorded, the Rufous Fantail (*Rhipidura rufifrons*), which is listed as migratory under the EPBC Act.

Fauna Habitat

The vegetation within the study area provides suitable foraging habitat for a range of species. Eucalypt and Corymbia species dominate the overstorey and provide food sources (foliage, nectar, pollen, exudates and invertebrates) for birds, bats and arboreal mammals. *Allocasuarina torulosa* is a preferred feed tree species for the threatened Glossy Black-cockatoo.

The varied ground layer provides habitat for small mammals, reptiles and woodland birds and is enhanced by woody debris and leaf litter. The high density of fallen logs provides plenty of hollows and fissures used for shelter by small mammals. Reptiles shelter underneath logs and in dense leaf litter. The relatively grassy ground layer supports grazing macropods and wombats.

Seven hollow-bearing trees, each having one hollow, were recorded during field surveys (refer to approximate locations in Figure 4 of the Flora and Fauna Impact Assessment). Hollows ranged in size from small (< 10 centimetres) to medium (10 - 20 centimetre) and are suitable for a range of fauna species including microbats, possums, parrots and gliders. One large (> 30 centimetre) hollow suitable for forest owls was observed. Several trees had shallow scratches on the trunk, most likely from a possum species such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Brush-tailed Possum (*Trichosurus vulpecula*), that would provide prey items for owl species such as the Powerful Owl (*Ninox strenua*).

Koala Habitat

Suitable Koala feed trees were present within the study area at a density sufficient to warrant consideration as possible core Koala habitat as defined by SEPP 44. However, the SAT surveys did not locate any likely Koala scats, no deep scratching indicative of koalas was observed on suitable trees and no Koalas were located during spotlighting or through call playback.

6.6.2 Impact Assessment

Direct Impacts - Habitat Loss

A total of 1.284 hectares of native vegetation is proposed to be cleared to accommodate the new infrastructure. The vegetation to be cleared is on the edge of the cleared site facilities area and overburden emplacement area, it does not form part of an EEC and does not contain known critical foraging, feeding or breeding habitat for any threatened species. It does not contain significant rock outcrops or pools, ponds or streams that may form important shelter or breeding sites.

The proposed disturbance area contains seven hollow-bearing trees that would be removed as part of the increased footprint. The removal of hollow-bearing trees have been considered in the assessments of significance prepared under Section 5A of the EP&A Act (*i.e.* Seven Part Tests of Significance) discussed further in this Section. Hollow-bearing trees contain shelter and / or nesting habitat for nocturnal and diurnal birds, bats, some reptiles and frogs. The impacts of the removal of hollow-bearing trees would be mitigated through site specific management actions as outlined in Section 6.6.3.

Connectivity and Edge Effects

No change in vegetation connectivity is expected as a consequence of the proposal due to the small amount of clearing required compared with the extent of surrounding connected native vegetation cover. Nor is there any expectation of habitat fragmentation given the likely small area to be removed and its proximity to the current operational quarry site.

Similarly, loss of vegetation may have an impact through increasing the area of “edge” where native vegetation adjoins cleared lands. Edge vegetation is more impacted by wind and has more sunlight penetration, changing its characteristics compared to intact native vegetation. Proposed new disturbance areas will be subjected to edge effects. However there is already an edge created through the development of the existing quarry and the edge would increase only marginally (refer to Figure 5). Therefore there is no expectation of significant increases in overall edge effects.

Intensified Operations - Noise, Lighting and Dust

The proposed intensification in production will result in the following changes and potential impacts:

- **Vehicle Movements:** There will be an increase in the number of vehicle movements and therefore the regularity of noise. The vehicle noise volumes will remain the same as the same types of vehicles will use the internal haul roads and the main access road during intensified operations. Given the speed of the vehicles using the road is low and the awareness of quarry staff around looking out for and avoiding fauna collisions (as a result of staff training), road-kill is not expected to increase significantly. The extension of operating hours into the night (6am - 10pm Monday to Friday) compared to current levels (6am - 6pm Monday to Friday) will expose nocturnal species to vehicle noise; and
- **Machinery Operations:** The operating hours of machinery will increase by approximately 25%, extending into the night through all seasons of the year (when required) and exposing nocturnal species to increased levels of noise and light. However, it is noted that there is already a small level of nightly activity during the winter months and that the quarry has been in operation since 1986. Therefore the local fauna has been subject to quarry noise and light for an extended period of time. There will also be an increase in the period over which dust is emitted from the site on a daily basis. The surrounding habitat has been exposed to dust emissions for almost 30 years, with no visible signs of deterioration due to deposited dust. The air quality assessment has also determined that particulate matter emissions during intensified production, would be well within the relevant air quality assessment criteria.

Based on the above observations, there is unlikely to be any significant increase in fauna road-kills and the increase in fauna exposure to operational noise and light is not significant. However, further consideration has been given to the potential for increased levels of dust and extended hours of noise and light, particularly into the night, through a literature review on the impacts of these activities on fauna and flora (refer to Section 4.1.3 of the Flora and Fauna Impact Assessment). This review concluded that:

- As there is unlikely to be a significant change in the noise levels associated with the proposed intensification in production, the extension of operating hours is not expected to have a negative impact on species occupying the site and surrounds. In addition, the areas of fauna habitat exposed to increased periods of noise associated with the intensification in production, constitute a small percentage of the available habitat within the locality, leaving the majority of fauna habitat unaffected by the proposal;

- The impact on fauna due to artificial lighting during the night varies depending on the species. The nocturnal species considered are frogs, owls and the threatened Grey-headed Flying Fox. There is no breeding habitat available in the study area for relevant threatened frogs (requiring temporary pools or streams). Owls are visual predators and so are likely to be unimpeded by additional periods of artificial light, as they use light to hunt and the Grey-headed Flying Fox is known to consistently use lit urban areas. Fauna species of interest are therefore unlikely to be impacted by increased periods of artificial light associated with the proposal. In addition, the areas of fauna habitat exposed to increased periods of light will still remain unlit during the majority of the night hours and these areas of fauna habitat constitute a small percentage of the available habitat within the locality, which has low densities of development, leaving the majority of fauna habitat unaffected by artificial light;
- There is insufficient literature on potential impacts on fauna associated with dust deposition. Irrespective, the Air Quality Impact Assessment prepared for the proposal, predicted that all particulate matter emissions from the proposed intensified operations would meet all EPA assessment criteria at the closest receivers. Of particular interest is the incremental dust deposition rate associated with the proposal, which is predicted to be below 0.1 mg/m²/month (2 g/m²/month is the incremental dust deposition criteria) at all identified sensitive receivers). The proposal is therefore unlikely to elevate the dust deposition levels significantly in the local area. With the implementation of the existing and proposed dust controls (refer to Section 6.5.3), it is unlikely that the intensified operations would result in greater impacts on the surrounding biophysical environment and associated species than the existing approved operations.

Affected Threatened Biodiversity

Ecological Communities

No listed EECs were recorded within the study area and therefore the proposal will not impact on any EEC.

Flora

No threatened flora species have been previously recorded within the study area (ERM 1999, CSR Readymix 2002 and Umwelt 2011). During the two separate site visits undertaken between December 2013 and February 2014 no threatened flora species were identified. However, habitat potentially suitable for two threatened species, the Leafless Tongue-orchid and the Eastern Underground Orchid was identified.

Targeted surveys were undertaken during both site visits for threatened plants including the Leafless Tongue-orchid. Although the targeted surveys were undertaken at appropriate times to locate this species, it was not detected. It is therefore reasonable to conclude that the Leafless Tongue-orchid is not present in the proposed disturbance area and therefore this species does not require further assessment.

The threatened Eastern Underground Orchid could not be surveyed for as it is an underground species that can only be detected when it flowers between September and November. The Eastern Underground Orchid is currently known from fewer than 10 locations, but has been recorded less than 40 km away in the Bulahdelah area and given the potentially suitable habitat on site, it has the potential to be present. If present, any impact could be considered to be significant based on the few known locations for the species and therefore very small population size.

OEH advised in a phone conversation on the 26th of June 2014 that a (Section 5A) seven part test and EPBC Assessment should be undertaken for the Eastern Underground Orchid with it being presumed to be present in the proposed disturbance area. These

assessments concluded that there is likely to be a significant impact on the Eastern Underground Orchid if it was found to be present.

It is therefore recommended that a targeted survey is undertaken for this species between September and November, in order to establish if the Eastern Underground Orchid is present in the proposed disturbance area.

Threatened Fauna

The Grey-headed Flying Fox (*Pteropus poliocephalus*) was the only threatened fauna species recorded within the study area during surveys. One fauna species was recorded, the Rufous Fantail (*Rhipidura rufifrons*), which is listed as migratory under the EPBC Act. Of the 51 threatened fauna species that have previously been recorded within 10km of the study area, 20 have been identified as previously known from, or having sufficiently suitable habitat within the study area, to have a moderate or higher likelihood of occurrence (refer to the likelihood of occurrence Table 6 in the Flora and Fauna Impact Assessment).

Assessments of significance (Seven part tests) were carried out for these 22 species (refer to Appendix 2 of the Flora and Fauna Impact Assessment) and concluded that there will be no significant impacts on any threatened fauna as a result of the proposal. This is based on the relatively small area to be disturbed, the general location of clearance in already disturbed habitat and the presence of large areas of similar, relatively undisturbed vegetation surrounding the study area.

Koala Habitat

The Study area contains Koala feed trees at a suitable density to be potential core Koala habitat. However the lack of records from previous surveys, the paucity of database records within 20km of the study area, and the failure to locate any individuals or definite signs of Koala presence during the site survey, all indicate that there is not a breeding population of the Koala present within the study area. Consequently, the study area does not contain core Koala habitat, there is no evidence of koala breeding activity or any form of resident population and therefore this species does not require further consideration or assessment.

6.6.3 Mitigation Measures

The following mitigation measures are proposed to minimise any impacts of the proposal on flora and fauna in addition to those identified in the existing Flora and Fauna Management Plan (which forms part of the Jandra Quarry Environmental Management Plan):

- Undertake a two-stage tree removal process. This would involve the clearing of understorey and all non-hollow bearing trees to leave hollow-bearing trees remaining isolated for a single night. This would encourage any fauna using the trees to vacate the tree and move to alternative den sites. The hollow-bearing tree would then be removed the following day with an ecologist or wildlife carer suitably qualified to handle fauna (including micro-bats) in attendance to rescue any injured fauna. The preferred timing for this action is outside of winter, when species are hibernating;
- The inclusion of nesting boxes, at a ratio of 2:1 for every hollow removed and maintained for five years post clearance. The nest boxes would need to match the size of the hollows removed. This would compensate for the loss of these hollows and so maintain the density of available hollows. The nest boxes to be installed would include boxes designed to meet the requirements of hollow dependent birds, mammals and bats. The location of nest boxes should be determined in consultation with a suitably qualified ecologist;

- Undertaking a targeted seasonal survey (between September and December) for the Eastern Underground Orchid prior to commencement of any clearing, to assess the presence or absence of this species. Should this species be detected, then Holcim would:
 - Liaise with the relevant authorities regarding mitigation and management of impacts; and
 - Give consideration to the preparation of a Referral to DotE in accordance with the EPBC Act;
- Vegetation management in accordance with the existing Flora and Fauna Management Plan and current best practice particularly:
 - Measures to reduce the impacts of weeds during and immediately after the construction phase of the new heavy vehicle access road and expansion of the finished product stockpile area, when ground disturbance has the potential to create conditions conducive to weed establishment in adjacent areas if not managed appropriately.

Key elements of the existing Flora and Fauna Management Plan that should be of particular focus during the intensified operations include:

- Avoidance of road mortality through the use of appropriate signage, speed limits and staff awareness programs;
- Habitat protection and maintenance through the use of fencing; and
- Habitat enhancement of undisturbed forest areas.

6.7 Heritage

The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area will be located on land that falls outside of the approved disturbance area. Construction of this infrastructure will result in ground disturbance, which has the potential to impact on archaeological items of Aboriginal and cultural heritage value.

In order to fully understand the potential Aboriginal heritage impacts of the ground disturbance associated with the proposed modification, Niche Environment and Heritage were appointed to conduct an Aboriginal heritage due diligence assessment (refer to Appendix E). The assessment has been prepared in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (OEH 2010) (“the Code”) and the *National Parks and Wildlife Regulation 2009*.

To satisfy the requirements of the Code and best practice standards, the scope of the assessment included:

- A desktop review of previous studies and reports relevant to the study area;
- A search of the Aboriginal Heritage Information Management System (AHIMS) maintained by OEH to identify known Aboriginal objects and sites within the study area and / or its vicinity;
- A search of the Local Environmental Plan Heritage Schedules;
- Consideration of the landscape context and land use history;
- Physical inspection of the proposed new disturbance area for evidence of Aboriginal occupation and / or utilisation. This included inspection of all large growth trees located within the study area for evidence of cultural modification;

- Assessment of the significance of any identified Aboriginal sites / objects; and
- Provision of management recommendations to avoid / mitigate impact on any affected Aboriginal sites / objects.

The study area referred to in this Section includes the disturbance footprint of the proposed new infrastructure outlined above and the immediate surrounds (refer to Figure 2 of the Aboriginal Heritage Due Diligence Assessment).

6.7.1 Existing Environment

A search of the Greater Taree LEP (2010) was undertaken on 5 February 2014. No Aboriginal or non-Aboriginal heritage items listed on the LEP are located within or in close proximity to the study area.

An extensive AHIMS search was conducted on 5 February 2014 (AHIMS search ID #123969) (refer to Section 6 of the Aboriginal Heritage Due Diligence Assessment for the AHIMS search results). The search covered an area within 10 kilometres of Jandra Quarry and encompassed the study area. Sixteen previously recorded Aboriginal archaeological sites are located within the search area. Seven of these previously recorded Aboriginal archaeological sites were identified in the Aboriginal heritage assessment that was undertaken during the preparation of the EIS as part of the original development application in 1999. That Aboriginal heritage assessment (ERM 1999) concluded that all seven sites are of low or medium significance. Four of the Aboriginal archaeological sites will be impacted by the already approved operations and are the subject of an existing Aboriginal Heritage Impact Permit (permit No. N57/CDS/2000). It was recommended that the other three Aboriginal archaeological sites be conserved for educational purposes, two indefinitely and the other until the quarry void is extended into the site, at which time a consent to destroy would be required. None of these previously recorded Aboriginal archaeological sites fall within the proposed new disturbance area.

The study area that is the subject of this Aboriginal heritage due diligence assessment is located primarily on steep mid-slopes immediately east and bordering on the approved site facilities disturbance area (refer to Figure 2 in the Aboriginal Heritage Due Diligence Assessment). The study area is located within 200 metres of a watercourse, an ephemeral drainage channel, which is a minor tributary of Talawahl Creek. At the time of the site inspection the drainage channel did not contain water. The geology of the study area is made up of shale and greywacke hornfels. This geology is not conducive to the creation of rock shelters or overhangs, which could have been occupied by Aboriginal people. Greywacke is a raw material type, which was commonly used in the local area to construct stone tools. Soils within the study area are shallow with only the top 10 centimetres of the soil profile comprising a dark brown humic loam, which sits on a yellow clay (ERM 1999).

Consultation with the Aboriginal Community

Consultation with the local Aboriginal community at the due diligence assessment stage is not mandatory to satisfy the Code, however, it is considered best practice to include Aboriginal community consultation in the early stages of assessment. Site officers from the Forster Local Aboriginal Land Council (LALC) and Purfleet-Taree LALC were invited to attend the site inspection. Forster LALC did not respond to phone or email invitations prior to the site inspection so did not have a representative attend. A site officer from the Purfleet-Taree LALC was present during the site inspection. On-site correspondence with the Purfleet-Taree LALC concluded that the study area did not contain any sites or objects of cultural significance.

This draft Aboriginal Heritage Due Diligence Assessment report was sent to Forster LALC and Purfleet-Taree LALC on 2 June 2014 for review and comment. Follow-up emails and phone calls were made to Forster LALC and Purfleet-Taree LALC between 3 June 2014 and 26 June 2014. No comments relating to the draft report were received.

6.7.2 Impact Assessment

Aboriginal Heritage

The site inspection revealed the study area had been subject to historical disturbances associated with the quarry operations. The study area is located primarily on steep mid-slopes and has low ground surface visibility.

The site inspection did not locate any Aboriginal sites or objects and confirmed that the study area has low potential to contain Aboriginal sites or objects.

Although the study area is located within 200 metres of an ephemeral water course, due to its location on steep mid-slopes (previous archaeological studies in the region generally located archaeological sites on gentle lower slopes near watercourses (ERM 1999)) and historical disturbance, it is unlikely that it would support Aboriginal objects.

The Aboriginal heritage due diligence assessment was prepared in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (OEH 2010) and the *National Parks and Wildlife Regulation 2009*. The assessment confirmed based on both desktop assessments and visual inspection that no Aboriginal objects or sites are located or are likely to be located within the study area, therefore no further investigation or assessment is required.

Non-Aboriginal Heritage

Non-Aboriginal heritage was considered during the due diligence process. Each Local Government Area (LGA) is required to create and maintain an LEP that identifies and conserves Aboriginal and non-Aboriginal heritage items. These items are protected under the EP&A Act and the Heritage Act. A search of the Greater Taree LEP 2010 was undertaken on 5 February 2014. No non-Aboriginal heritage items listed on the LEP are located within or in close proximity to the subject area and no non-Aboriginal heritage items were observed within the proposed new disturbance area during the site survey. The proposal is therefore unlikely to impact on non-Aboriginal heritage items.

6.7.3 Mitigation Measures

Although the Aboriginal heritage due diligence assessment concluded that no Aboriginal objects or sites are located or are likely to be located within the proposed new disturbance area, Aboriginal heritage sites within the development consent boundary will continue to be managed in accordance with the existing Aboriginal Heritage Impact Permit, the Jandra Quarry Environmental Management Plan and the relevant conditions detailed in development consent DA231-10-99.

To avoid impacts on potential unknown heritage items, activities associated with the construction of the new heavy vehicle access road and the expansion of the finished product stockpile area, would not be undertaken outside of the study area identified within Figure 2 of the Aboriginal Heritage Due Diligence Assessment.

If Aboriginal objects are located during the construction of the new heavy vehicle access road and the expansion of the finished product stockpile area, works would cease and a qualified archaeologist would be consulted.

6.8 Greenhouse Gases

Although greenhouse gas (GHG) emissions were not assessed in the 1999 EIS, GHG emissions including those from extractive industries, are a growing concern for the wider community. GHG emissions are becoming more regulated in all industries and this is exemplified through more stringent requirements in development applications and in corporate reporting. Holcim submitted their first National Greenhouse and Energy Reporting Scheme (NGERS) report in October 2009 and also reports under the *Energy Efficiency Opportunities Act 2006*.

A GHG emissions assessment was undertaken by Edge Environment (refer to Appendix H) to quantify the increase in GHG emitted as a result of the proposed intensification in production and to identify actions for mitigating or reducing emissions, where possible.

6.8.1 Impact Assessment

The GHG emissions assessment involved:

- Identification of the main sources of emissions during construction of the proposed new infrastructure (heavy vehicle access road and expansion of the finished product stockpile area) and operation of the quarry at increased production and transportation levels;
- Scoping and calculation of the emissions from each source using factors and methods outlined in relevant national and international GHG guidelines, standards and protocols; and
- Investigating and recommending strategies for emissions mitigation to reduce GHG emissions associated with construction and operational activities.

The measurement boundaries and emission sources investigated, including assumptions made, are outlined in the GHG Emissions Assessment.

Construction Based GHG Inventory

The construction activities associated with the proposed intensification in production will include the transport of materials to and from site, decomposition of vegetation waste and the use of machinery and vehicles for preparation of the site and civil works. These activities require the use of fuels and electricity, which will result in the release of associated GHG emissions.

Site Preparation

The total estimated emissions from site preparation are **8.70tCO₂e**. This includes emissions from vegetation clearing to prepare the site for construction of the new heavy vehicle access road and the expansion of the finished product stockpile area (including emissions from decomposition).

Construction of Heavy Vehicle Access Road

The total estimated emissions from the construction of the heavy vehicle access road were **37.11tCO₂e**. It should be noted that the majority of the pavement material for the construction of the new heavy vehicle access road will be produced on site. It is anticipated that the provision of these materials will fall under normal site operations and only a limited number of materials will be imported to the site.

Operations Based GHG Inventory

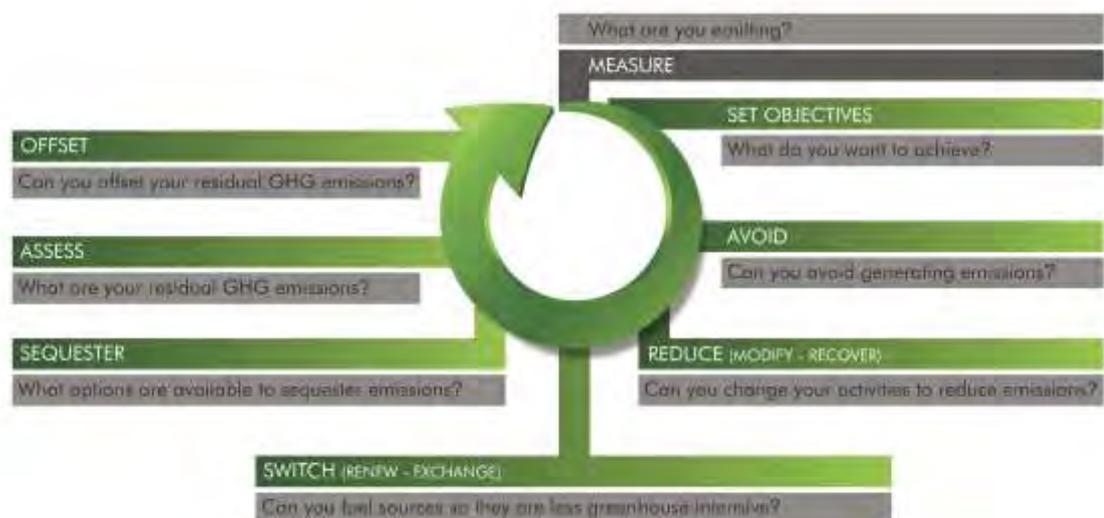
Total emissions from the operation of the facility are expected to increase by approximately **1,385.49tCO₂-e to 3,004.36tCO₂-e/annum**. This increase is directly related to the proposed increase in production and transportation of finished quarry products. Although the proposed intensification in production will increase annual GHG emissions, the extractive resource is being extracted in a shorter time period and therefore the total emissions associated with the production and transportation of quarry products, will not increase over the life of the quarry.

When compared with the operational emissions the construction emissions of 45.37 tCO₂e represents approximately 3% of current annual operational emissions and approximately 1.5% of the anticipated operational emissions following intensification in production.

6.8.2 Mitigation Measures

The carbon management principles presented in Figure 10 provide a robust framework for the management and reduction of GHG emissions.

Figure 10: Carbon management principles for emissions reduction (Victorian EPA)



Recommended actions to further reduce emissions should ideally be prioritised according to the carbon management principles outlined below.

- **Avoid:** Actions which avoid emissions, in the first instance, should be considered as a priority;
- **Reduce:** Actions which result in a reduction of emissions should be considered next; followed by
- **Switch:** Actions which switch energy sources to reduce emissions;
- **Sequester:** Actions which sequester GHG emissions do not reduce emissions but store them; and
- **Offset:** Offsetting of emissions through the purchase of offsets. This should be considered as a last resort.

Possible GHG management actions could include:

- Regular monitoring of emissions throughout the project to assess the effectiveness of emissions mitigation actions;
- Where construction materials cannot be sourced from the quarry, use locally sourced materials to reduce emissions associated with transport;
- Recycle / compost waste wherever possible;
- Plan construction and operational works to avoid double handling of materials and minimise haulage distances, thereby minimising the use of fuel;
- Train both on-site and product transportation staff on efficient driving practices e.g. throttling down and switching off machinery when not in use;
- Make use of recycled or low impact materials to reduce emissions associated with embodied energy (not estimated in this report);
- Investigate the procurement of energy efficient equipment for the site (*i.e.* replacement parts for the processing plant, mobile crushing plant, dozers, excavators, front end loaders and trucks etc.). Consider the procurement of equipment that uses lower GHG intensive fuel (e.g. gas, ethanol). Holcim continuing their existing initiative of investigating fuel additives to reduce consumption and emissions;
- Sourcing electricity and fuels with low GHG intensity, where practical;
- Regular maintenance of equipment to maintain optimum operations and fuel efficiency; and
- Implementation of Holcim's energy savings plan and incorporate energy efficiency design aspects wherever possible to reduce energy demand. Examples could include energy efficient lighting systems, natural ventilation, insulation and other renewable forms of energy.

6.9 Socio Economic

The Jandra Quarry has been operating since 1986 without significant adverse impact on surrounding land uses or the socio-economic environment. With the exception of odour from the previous old asphalt plant (since decommissioned), there are no recorded complaints from neighbouring landowners. Holcim maintains a positive relationship with all Jandra Quarry neighbours and the Quarry Manager has an open door policy, welcoming any feedback on the quarry operations.

As outlined elsewhere within this report, an increase in production is required at Jandra Quarry to meet market demand. With Pacific Highway upgrade work around Port Macquarie predicted to peak in 2015 combined with other major infrastructure projects related to coal and gas development predicted over the next five years, Holcim has forecast peak annual demand to exceed 400,000 tonnes, reaching a maximum 475,000 tonnes in some years.

The proposed modification (outlined in detail in Section 3.2) involves:

- Intensified operations (longer hours and increased production and transportation volumes);
- New infrastructure at a capital investment value of \$65,000 including:
 - Construction of a new heavy vehicle access road, approximate costs \$30,000;
 - Expansion of the finished product stockpile area, approximate costs \$20,000; and
 - Construction of a second training room, approximate costs \$15,000.

- Direct employment of an additional six staff including:
 - Three quarry production staff; and
 - Three truck/transport drivers.

In addition to the standard wages paid to these six full time employees, overtime is commonly paid in the quarrying industry and this can account for an additional 30% in income per annum to employees. Based on existing employee statistics, it is likely that new employees will live within a 50 kilometre radius of the quarry site.

6.9.1 Overview

The key economic benefits of quarrying include direct and indirect employment, flow on spending or multiplier effects, tax revenues to government for reinvestment and improved availability and competitive pricing of local building materials.

The proposed intensification in production at Jandra Quarry delivers all these benefits. This section of the report identifies the nature, extent and distribution of these benefits as well as identifying strategies to enhance these benefits. The strategic importance of geographic proximity to market is the key economic benefit of the project, as it is vital to the cost-effective delivery of major infrastructure and development projects of state and national significance.

The key economic costs of quarrying can include the displacement of existing and potential economic activities, reduction in the viability of neighbouring land uses, and deflationary pressures on property value. Due to the nature of the proposal (being an intensification in production rates of the existing quarry), there are minimal economic costs to the community associated with the proposed modification, as the quarry is already established. The intensification in production will not extend the quarry pit (extraction area) and therefore the modification will not impact on adjacent property development opportunities any more than it already has.

This analysis relies on quantitative assessments using multiplier analysis for matters such as employment, direct and indirect economic flow, and more qualitative discussion on wider issues and impacts.

The intensification in production at Jandra Quarry will provide the following key benefits:

- Uninterrupted supply of essential construction materials to local and regional development projects at cost-effective prices;
- Employment of an additional three full time employees and three truck/transportation drivers, with further jobs created through flow-on effects;
- Contribution to the economy of \$186,290 in direct and indirect benefits from construction works and \$1,751,420 in ongoing operational costs;
- Optimal use of a regionally-significant resource; and
- Economic benefits to the local community through the purchase of goods and services and local expenditure both directly and indirectly through employee wages.

As detailed in this analysis, the project offers a net economic benefit to the NSW economy.

6.9.2 Socio Economic Profile of Greater Taree City

For the purpose of this report, an analysis of the socio-economic profile of Greater Taree City (LGA) is provided below.

The size of Greater Taree City's labour force in 2011 was 18,072, of which 6,923 were employed part-time and 9,105 were full time workers (refer to Table 20).

Analysis of the employment status (as a percentage of the labour force) in Greater Taree City in 2011 compared to Regional NSW shows that there was a lower proportion in employment, and a higher proportion unemployed. Overall, 90.7% of the labour force was employed (43.3% of the population aged 15+), and 9.3% unemployed (4.4% of the population aged 15+), compared with 93.9% and 6.1% respectively for Regional NSW. The labour force participation rate refers to the proportion of the population over 15 years of age that was employed or actively looking for work. *"The labour force is a fundamental input to domestic production. Its size and composition are therefore crucial factors in economic growth. From the viewpoint of social development, earnings from paid work are a major influence on levels of economic well-being."* (Australian Social Trends 1995).

Analysis of the labour force participation rate of the population in Greater Taree City in 2011 shows that there was a lower proportion in the labour force (47.7%) compared with Regional NSW (56.4%)¹¹.

Table 20: Employment Status

Greater Taree City LGA - Total persons (Usual residence)	2011			2006			Change 2006 to 2011
	Number	%	Regional NSW %	Number	%	Regional NSW %	
Employment status							
Employed	16,398	90.7	93.9	15,978	89.4	92.9	+420
Employed full-time	9,105	50.4	56.7	9,171	51.3	56.5	-66
Employed part-time	6,923	38.3	35.0	6,386	35.7	33.8	+537
Hours worked not stated	370	2.0	2.1	421	2.4	2.6	-51
Unemployed (Unemployment rate)	1,674	9.3	6.1	1,885	10.6	7.1	-211
Looking for full-time work	1,083	6.0	3.8	1,310	7.3	4.6	-227
Looking for part-time work	591	3.3	2.4	575	3.2	2.5	+16
Total Labour Force	18,072	100.0	100.0	17,863	100.0	100.0	+209

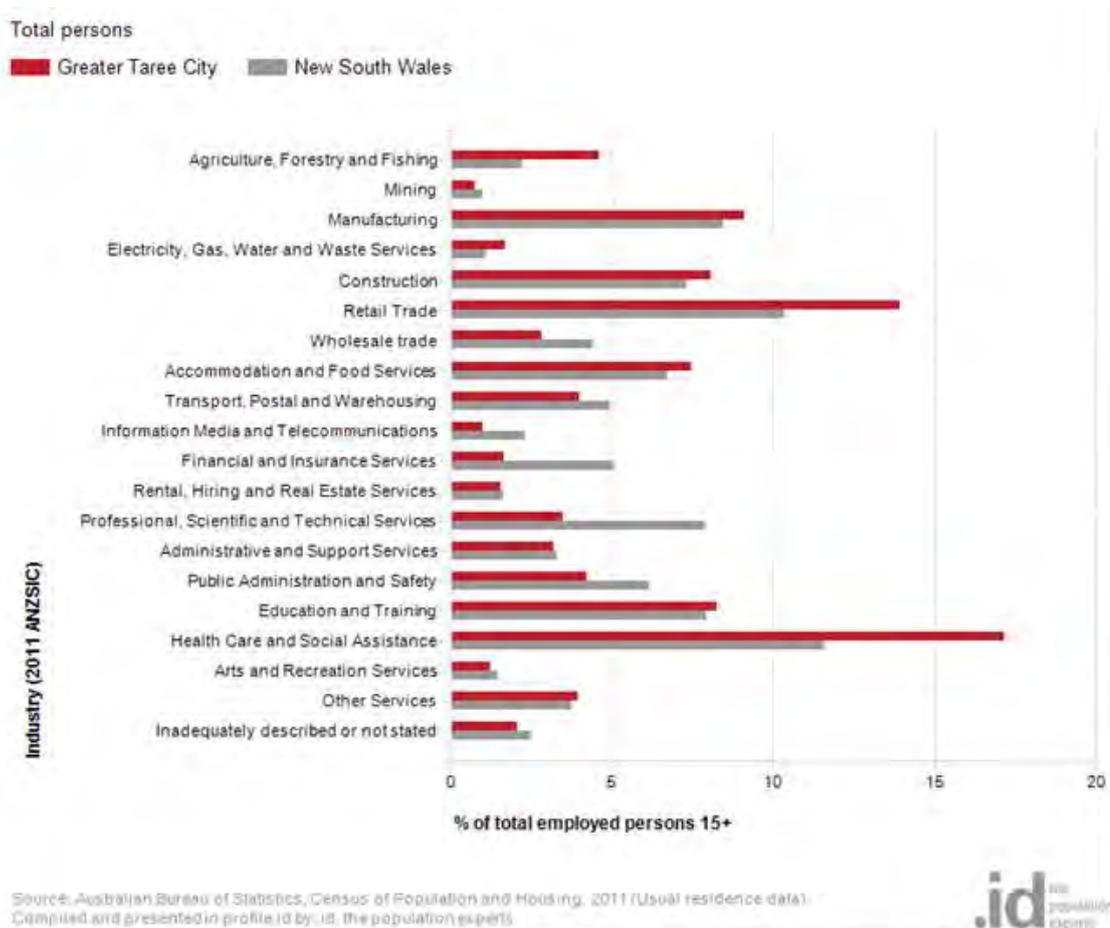
Source: Australian Bureau of Statistics, Census of Population and Housing 2006 and 2011. Compiled and presented in profile.id by .id, the population experts.

An analysis of the jobs held by the resident population in Greater Taree City in 2011 shows the three most popular industry sectors were:

- Health Care and Social Assistance (2,814 people or 17.2%);
- Retail Trade (2,285 people or 13.9%); and
- Manufacturing (1,494 people or 9.1%).

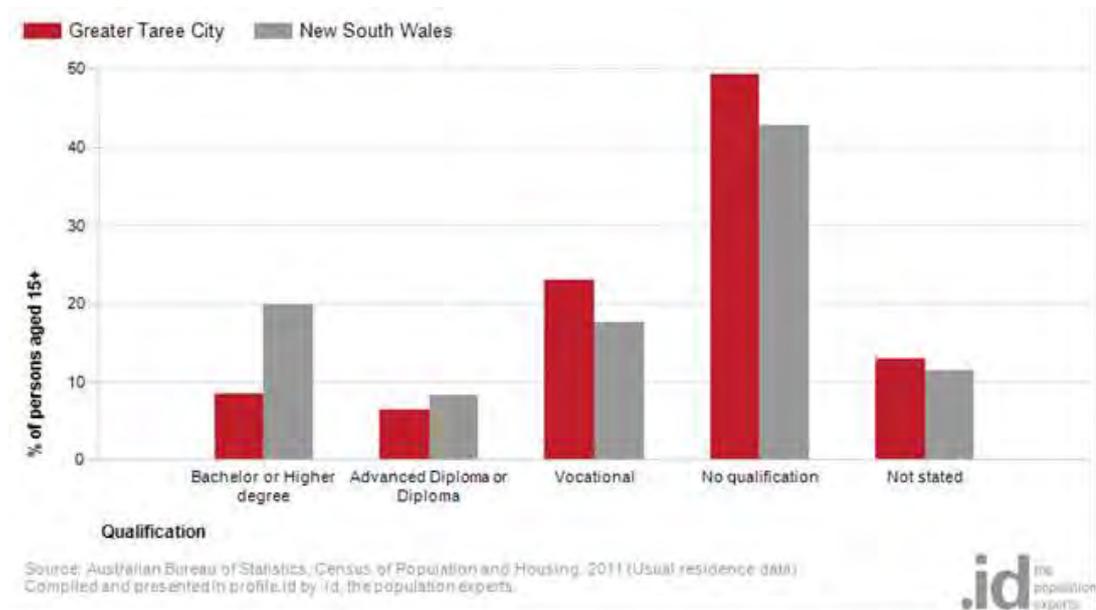
¹¹ <http://profile.id.com.au/greater-taree/employment-status>

Figure 11: Industry Sector of Employment, 2011



Analysis of the qualifications of the population in Greater Taree City in 2011 compared to New South Wales shows that there was a lower proportion of people holding formal qualifications (Bachelor or higher degree; Advanced Diploma or Diploma; or Vocational qualifications), and a higher proportion of people with no formal qualifications. Overall, 37.8% of the population aged 15 and over held educational qualifications, and 49.3% had no qualifications, compared with 45.8% and 42.8% respectively for New South Wales.

Figure 12: Highest Qualification Achieved, 2011



Analysis of individual income levels in Greater Taree City in 2011 compared to New South Wales shows that there was a lower proportion of people earning a high income (those earning \$1,500 per week or more) and a higher proportion of low income people (those earning less than \$400 per week).

Overall, 4.9% of the population earned a high income, and 46.7% earned a low income, compared with 13.1% and 36.7% respectively for New South Wales.

Table 21: Weekly Individual Income

Greater Taree City LGA- Total persons (Usual residence)	2011		
	Number	%	NSW %
Weekly gross income			
Negative Income/ Nil income	2,087	5.5	8.6
\$1-\$199	3,044	8.0	7.3
\$200-\$299	6,559	17.3	10.7
\$300-\$399	5,984	15.8	10.2
\$400-\$599	5,750	15.2	11.5
\$600-\$799	4,167	11.0	10.1
\$800-\$999	2,417	6.4	7.9
\$1000-\$1249	1,892	5.0	7.5
\$1250-\$1499	1,074	2.8	5.3
\$1500-\$1999	1,224	3.2	6.5
\$2000 or more	640	1.7	6.6
Not stated	3,023	8.0	8.0
Total persons aged 15+	37,861	100.0	100.0

Source: Australian Bureau of Statistics, Census of Population and Housing 2011. Compiled and presented in profile.id by .id, the population experts.

Table 22 shows that 13% of the population work outside the LGA with the vast majority living and working in the area (76.8%).

Table 22: Employment Location of Residents, 2011

Greater Taree City LGA	2011	
	Number	%
Live and work in the area	12,586	76.8
Live in the area, but work outside	2,126	13.0
Work location unknown	1,684	10.3
Total employed residents	16,396	100.0

Source: Australian Bureau of Statistics, Census of Population and Housing 2011. Compiled and presented in profile.id by .id, the pollution experts.

6.9.3 Summary Greater Taree's Social and Economic Profile

Greater Taree City's Gross Regional Product is estimated at \$1.44 Billion, which represents 0.3% of the state's GSP (Gross State Product)¹². The area has a lower proportion of people in employment, and a higher proportion unemployed compared to the NSW state average. Mining / extractive industries is one of the smallest sectors of employment and there is a higher proportion of people holding no formal qualifications.

The proposed modification will have a positive impact on the social and economic profile of the region in a number of ways:

- The new employees at the quarry are likely to live in the area therefore increasing the percentage of people who live and work in Greater Taree;
- The average employee wage at the quarry is higher than the mean gross weekly income of Greater Taree residents;
- The quarry will improve FTE job numbers (both directly and indirectly) which will improve employment status figures; and
- Jobs offered at the quarry will strengthen the mining / extractive industry sector of employment, which in 2011 was the lowest sector of employment in the area.

6.9.4 Multiplier Analysis

Multiplier analysis is a standard tool of economic assessment used to calculate the flow-on effects on income, investment and employment of a proposed net autonomous investment. The multiplier effect operates because the initial investment requires the purchase of labour, goods and other services and these purchases generate further flow-on expenditure. At each round of investment and expenditure the effect diminishes until a final total increase in the economy can be calculated. It is the ratio of the value of the final impact across the economy to the initial investment that is termed the multiplier.

Expenditure by additional employees engaged in the ongoing intensified operations of the quarry as well as in the construction of the associated infrastructure and facilities also has

¹² <http://economy.id.com.au/greater-taree/home>

multiplier effects at many levels of the economy. Expenditure on weekly items such as food, fuel, household items, motor vehicles, housing, entertainment, health and education are mostly made in the local area and have flow on or ripple effects through the local economy. The actual mechanics of deriving multipliers is based on the use of transactions tables. These transaction tables show the linkages between industries in terms of the purchases of goods and services by each, and from each industry of the economy.

The size of the multiplier ratio depends on several factors including the particular economy's ability to supply the goods needed. If a large proportion of goods are imported from outside of the region, the multiplier will be reduced. This also holds if goods are provided from outside the state or nation. Multipliers can be estimated for a local area economy, a state or a national economy. The size of the multipliers will always increase as the analysis moves from local to state to national levels as at each level the economy provides a more diverse range of goods and services. The more equipped a local area, region or state is to provide the required goods and services, the greater the local benefit.

The transaction tables used in this analysis are based on those developed at the national level by the Australian Bureau of Statistics (ABS). This means that some value judgements and relativities have been made to determine relevant estimates for the state and local levels. This analysis leans on similar analysis for quarries across Australia.

The multipliers estimated in this report are for economic output and employment. An employment multiplier is similar to an output multiplier and indicates the way in which the project generates further jobs throughout the local and wider economies. Multipliers have been estimated in this analysis for the ongoing intensified quarry operations, for the associated construction activities, and for the expenditures by additional employees.

6.9.5 Economic Impact during Construction Phase

The most immediate impact will come from the construction of infrastructure and site facilities that are required to support the intensification in production. Construction investment includes employment and payment of wages, the purchase of construction materials and products. This results in induced consumption and production impacts in the economy. The multiplier effects have been estimated using ABS and Australian National Accounts: Input-Output Tables 1996-97 (ABS Catalogue 5209.0). These tables identify first round effects, industrial support effects and consumption induced multiplier effects at rates of \$0.466, \$0.438 and \$0.962 respectively to every dollar of construction.

The ABS have also developed input output tables to help estimate the construction industry jobs directly created for every \$1 of construction output / investment. This equated to 1 employee for every \$111,111 of construction. The current or most up to date available rate from the ABS (December 2008) is \$178,000 per employee. Using the ABS CPI calculator this figure in March 2014 is \$203,000. This data can be used to estimate the direct jobs generated during the construction phase.

The ABS notes that "Care is needed in interpreting multiplier effects; their theoretical basis produces estimates which somewhat overstate the actual impacts in terms of output and employment. Nevertheless, the estimates illustrate the high flow-on effects of construction activity to the rest of the economy. Clearly, through its multipliers, construction activity has a high impact on the economy."

An estimated construction budget is provided in the Table 23.

Table 23: Estimated Construction Budget

Capital and Construction elements	Estimates Cost 2014*
Heavy Vehicle Access Road construction	\$30,000
Site Facilities (training room)	\$15,000
Expansion of finished product stockpile area	\$20,000
Total	\$65,000

Source: Holcim (Australia) Pty Ltd

*Costs after savings from using Jandra Quarry staff, equipment and materials.

Table 24: Economic Contribution Associated with Construction Costs

Construction	Direct Effects	Production Induced Effects		Consumption Induced Effects	Total
		First Effects	Round Industrial Support Effects		
Output multipliers	1.00	0.466	0.438	0.962	2.866
Output	\$65,000	\$30,290	\$28,470	\$62,530	\$186,290

Data Sources: Australian National Accounts: Input-Output Tables 1996-97 (5209.0), Price Index of the Output of the Building Industry - Producer Price Indexes (6427.0), CPI All Groups - RBA Bulletin (Table G2).

The multipliers presented in Table 24 indicate a construction project costing \$65,000 could result in a positive wider multiplier effect factor of 2.86. Given the estimated construction capital investment phase budget of \$65,000 the proposed modification will generate economic value to the state and nation in the order of \$186,290.

The proposed modification will generate employment opportunities of a temporary nature during construction works, with further jobs created from production and consumption induced effects. Therefore, the proposed modification will have a positive impact on employment generation both directly and in the wider economy during construction.

6.9.6 Economic Impact during Operational Phase

Operational employees working at the quarry will have an economic impact through expenditures from their weekly earnings. This will have a beneficial direct and flow on effect on the local and regional economies. At present, quarry workforce is drawn from within the Greater Taree LGA. It is assumed this will continue to be the case.

During operations, the annual payment to wages and salaries to new staff will be approximately \$484,800 (refer to Table 25).

Table 25: Proposed Quarry Annual Wages

Position	Salary	Staff	Total Wages	OT @ 30%	Total
Truck/Transport Driver	\$49,000	3	\$147,000	\$44,100	\$191,100
Production employees	\$52,000	3	\$156,000	\$46,800	\$202,800
Employee on costs at 30% ¹³ salary			\$90,900	0	\$90,900
Total			393,900	90,900	484,800

¹³ http://workplaceinfo.com.au/payroll/wages-and-salaries/analysis/whats-the-total-cost-of-an-employee#.U70_S0aKB9A

The injection of an additional \$838,000 into the economy in the form of the increased operating budget of the quarry has the direct and flow on impact of generating \$1,751,420 additional value to the economy. This estimate (refer to Table 26) is based on a conservative assessment of ABS, Treasury reports and other recent assessments of similar projects¹⁴.

Table 26: Estimated Operating Annual Budget (non-wage)

Operating Expense	Estimated Budget
Fuel (diesel @ \$1.38/L).	\$210,000
Consumables	\$9,000
Explosives	\$23,000
Administration/other	\$90,000
Equipment Hire	\$22,000
TOTAL	\$354,000
Operating Expenses including Wages (per annum)	\$838,000

6.9.7 Impacts on Government Finances

The impacts of the intensification in production on government finances will take a number of forms, and will accrue to the Commonwealth and State Governments.

From a NSW Government point of view, the most significant impact on government finances will come in the form of payroll tax. In NSW the rate of payroll tax is currently 5.45 % on all salaries paid above a threshold of \$750,000. Current salaries at the Jandra Quarry exceed this threshold and therefore the additional salaries associated with the intensification in production will be subject to payroll tax. Payroll tax is not applied, in this analysis, to payments during the construction phase, as a portion of this work will be done by contractors. Annual payroll of \$484,800 will generate annual payroll tax of \$26,421 annually. In addition the quarry will pay the NSW government annual licensing fees.

From a Commonwealth point of view there will be tax generated as both a direct and indirect consequence of construction activities, site facilities enhancements and operations of the quarry. The Commonwealth Government will gain from the following tax streams:

- Personal income tax on annual salaries;
- Annual Medicare levies on those salaries;
- GST payment on goods and services purchased during construction and operation both direct and indirect;
- Tax derived from revenue flow from projects or businesses that are generated as a result of the proposed intensification in production; and
- Company tax on this business and flow on businesses transactions.
- These have not been estimated as there are too many unknowns to make a realistic independent estimate. However, they should not be discounted as inconsiderable.

¹⁴ There is considerable conjecture about the flow on impacts of mining and quarrying. The figures used in this analysis are on the conservative side of data produced by the ABS, Treasury and The Minerals Council. <http://www.goldcoastquarry.com/assets/Documents/PP%20-%20Economic%20Impact%20Assessment/Appendix%20PP%20-%20Economic%20Impact%20Assessment%20-%20Part%201.pdf>

6.9.8 Relevant Legislation Considerations

It is important to note that pursuant to State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 the economic benefits of mining and extractive industries is a major factor to be considered in determining development applications for these types of projects. Pursuant to Part 3 - Development applications - matters for consideration, the consent authority must consider the significance of the resource that is the subject of the application, having regard to:

- (a) the economic benefits, both to the State and the region in which the development is proposed to be carried out, of developing the resource, and*
- (b) any advice by the Director-General of the Department of Trade and Investment, Regional Infrastructure and Services as to the relative significance of the resource in comparison with other mineral resources across the State.*

The economic benefits are derived from:

- (a) employment generation,*
- (b) expenditure, including capital investment,*
- (c) the payment of royalties to the State.*

As detailed within this report, a beneficial cumulative impact is achieved in terms of economic impact.

The proposed modification will have economic benefits via the provision of direct and indirect employment and monetary contributions (in various forms) at a local, state and national level.

6.9.9 Mitigation Strategies

Mitigation strategies are processes, programs or plans designed to address the perceived issues and impacts associated with a project. These strategies may serve to enhance the positive impacts associated with the proposed modification, or mitigate or ameliorate any negative impacts.

Issues typically covered in social impacts assessments which impact on the quality of life of local residents such as disturbance from noise, dust and traffic have been discussed and will be minimised. However it is worth recognising that in some locations these impacts need to be costed due to the proximity of residential or tourist communities. In the case of this quarry there are no significantly sized communities living within 5 kilometres of the site.

The mitigation measures which have been considered to address socio-economic issues include the following:

- Rehabilitation will ensure that the potential of other unplanned long term uses on adjacent lands are not compromised;
- The quarry has a proactive policy of recruiting operational staff as much as possible from the local area; and
- The quarry sources supplies as much as possible from the local area.

6.9.10 Conclusion

The proposed increase in production at Jandra Quarry will result in the efficient use of a scarce economic resource. The proposed modification stems from the large demand of suitable material, which Jandra Quarry contains, for the upgrade of the Pacific Highway and

other infrastructure projects. From a social viewpoint, the proposal provides a valuable resource and is well located (being in close proximity to the Pacific Highway) which also has a benefit to the wider community because it avoids transporting materials over a longer distance on smaller, local roads and potentially impacting on a greater number of people.

The economic benefits of the proposed modification include a net increase in employment opportunities (both during construction and operational phases); construction expenditure of \$65,000; flow on and multiplier effects as a result of the additional capital investment and ongoing expenditure injection into the economy; increased operational expenditure of \$838,000 per annum; and tax revenue to State and Commonwealth governments.

Based on the estimated construction capital value of \$65,000, the proposed modification will generate economic value (direct and indirect benefits) to the state and nation in the order of \$186,290.

The injection of an additional \$838,000 into the economy annually in the form of the increased operating budget of the quarry has the direct and flow on impact of generating \$1,751,420 additional value to the economy.

In summary, the proposed intensification in production at Jandra Quarry will generate employment and economic benefit for the local community as well as the wider region. Through the implementation of social and environmental mitigation measures as detailed in this report, potential adverse impacts can be satisfactorily managed. The proposed modification is therefore supported in terms of socio-economic impact.

6.10 Flooding and Groundwater

6.10.1 Flooding

As the majority of the Jandra Quarry site is elevated, in the upper catchment of minor tributaries (first order watercourses) of the Wallamba River, it does not fall within land identified in the LEP 2010 as flood prone land (potentially affected by the 1 in 100 flood probability). The Jandra Quarry site and the areas affected by the proposed modification, are therefore unlikely to be impacted by flood events.

6.10.2 Groundwater

The existing quarry is not subject to groundwater inflow. No groundwater was recorded by the geological investigations undertaken for the 1999 EIS. The geological investigations concluded that any groundwater was likely to be located in the fractured material above the basement rock. The groundwater impact assessment concluded that there was limited potential for groundwater flow as any groundwater would originate from subsurface flows following recent rainfall events rather than from interception of an aquifer.

Relatively shallow earthworks excavations, required for the construction of the proposed new heavy vehicle access road and expansion of the existing finished product stockpile area, are therefore highly unlikely to impact on groundwater.

The proposal will not result in any changes to the approved quarry pit in terms of both depth and disturbance area.

Further consideration of flooding and groundwater is therefore not considered necessary in assessment of the potential environmental impacts associated with the proposal.

6.11 Land Contamination

Potential to encounter or disturb areas of contamination are low with historical land uses (prior to the commencement of quarrying operations) being forested bushland surrounded by agriculture. Holcim are also unaware of any potential contaminating activities that have been undertaken within the proposed new ground disturbance area.

An EPA Contaminated Land Record search was undertaken in February 2014 and no sites were recorded within the Greater Taree LGA.

Six separate site surveys were undertaken during the EA process, of the proposed new disturbance area (aboriginal heritage survey, two flora and fauna surveys and three general site visits) and no evidence of contamination or potentially contaminating activities were identified. In the event that previously unidentified contaminated land is located during construction, relevant statutory requirements would need to be complied with. As such no further assessment of contaminated land or land remediation is required.

6.12 Visual Amenity

Topography of the site and surrounding area is generally undulating with rolling hills and plains. The existing quarry is cut into the northern face of the hillside and extends from the ridgeline in a north-easterly direction. The existing working face is visible from the Pacific Highway to the north, however equipment and structures associated with quarry operations i.e. the approved site facilities area and overburden emplacement area are not visible from surrounding areas.

Land surrounding the quarry is well vegetated to the perimeter of the property. Residential properties are located north, north-east, east, south and west of the quarry site. Views of the quarry from the surrounding residences are limited.

The existing visual environment from the nearest residential properties are as follows:

- One residential property located north of the site is well shielded from the quarry as it is situated within dense bushland;
- One residential property is located north east of the site. Views from this property are filtered by foreground vegetation so that the quarry are barely visible;
- Residential properties located to the east of the site, are well shielded from views of the quarry by vegetation and natural topography; and
- Three residential properties are located west of the site. The quarry is not visible from these properties as the quarry extraction works are limited to the eastern face of the western ridgeline.

Holcim manages visual impacts in accordance with the existing Landscape and Rehabilitation Management Plan, which includes the following measures:

- Relating vegetation at the top of cut faces;
- Progressively rehabilitating quarry benches above the self-draining elevation (RL 50); and
- Undertaking consultation with relevant land owners if visual impacts are identified.

6.12.1 Impact Assessment

A visual impact assessment was undertaken as part of the 1999 EIS. The potential visual impacts of the quarry that were identified included:

- Minor impacts on existing residential properties;
- An increase in the exposure of the quarry face when viewed from vehicles travelling in a southerly direction along the Pacific Highway. The time of exposure along the Pacific Highway was determined to be limited; and
- Negligible impact from the Taree lookout facility and Fire Tower.

The construction of the new heavy vehicle access road and expansion of the finished product stockpile area are the only proposed changes to the approved disturbance area. This proposed new infrastructure will be located immediately adjacent to the approved site facilities area and will be screened from all surrounding residential properties by existing vegetation and topography (refer to Figure 5).

The proposal will not result in any significant changes to the visual impacts predicted in the 1999 EIS. No further assessment of potential impacts on the visual amenity is therefore considered necessary.

Holcim will continue to manage visual impacts in accordance with the existing Landscape and Rehabilitation Plan.

6.13 Rehabilitation and Closure

6.13.1 Landscape and Rehabilitation Plan

A Landscape and Rehabilitation Plan was prepared for the site as part of the 1999 EIS.

The environmental objectives of the Landscape and Rehabilitation Plan are to:

- Minimise visual impact;
- Control runoff, preventing erosion and sedimentation; and
- Re-establish habitat for flora and fauna.

The Landscape and Rehabilitation Plan identified four specific areas for landscape treatment and rehabilitation:

- Wildlife corridors: The plan identified the need for revegetation of the land on the eastern side of the site (east of the quarry pit), which will integrate with wildlife corridors on adjacent land;
- Revegetated benches: The plan incorporated the progressive revegetation of quarry top benches following extraction (refer to Figures 6, 7, 8 and 10);
- Revegetated overburden stockpile and bund areas: These areas will be planted with native grasses and trees; and
- Revegetation of haul roads and hard stand areas: These intensely utilised areas of the quarry will be deep ripped and revegetated at the end of the quarrying operations.

Progressive implementation of the Landscape and Rehabilitation Plan will produce a stable landform, which is compatible with the surrounding area.

With the proposed intensification in production, the quarry is expected to have a minimum lifespan of approximately 29 years. However it is not proposed to increase extraction of the

overall resource. Therefore no additional extraction areas, outside the approved quarry pit disturbance area, need to be considered as part of the approved rehabilitation and closure strategy.

Erosion and sediment control requirements for the proposed heavy vehicle access road and expansion of the finished product stockpile area are outlined in Section 6.5. These areas will form part of the site facilities area and will be rehabilitated with the rest of the approved quarry operational areas in accordance with the Landscape and Rehabilitation Plan outlined in the 1999 EIS and included in the Jandra Quarry Environmental Management Plan.

6.13.2 End Land Use

As outlined in the 1999 EIS, once extraction has been completed, the quarry will be rehabilitated (using the methods described in the 1999 EIS and the Landscape and Rehabilitation Plan). Benches of the lower quarry void (below RL 50) will be stabilised, while the upper quarry area (above RL 50) will be rehabilitated to provide similar vegetation communities and fauna habitats, as previously occurred over the site and currently exist in surrounding bushland. The establishment of a dense shrub understorey in the site facilities area will function as a sustainable ecosystem, which reflects the natural ecology of the area.

As the life of the extractive resource (located within the approved extraction area presented in Figure 2) is expected to be a minimum of 29 years, a detailed evaluation of end land use has not been undertaken.

As was the case when preparing the Landscape and Rehabilitation Plan for the quarry in the 1999 EIS, it is impossible to predict accurately the likely future land use at the site, given the substantial changes expected to occur in the region over the next 30 years. Future land use will need to consider the applicable planning policy framework as well as the surrounding land use and environmental and market conditions at the time.

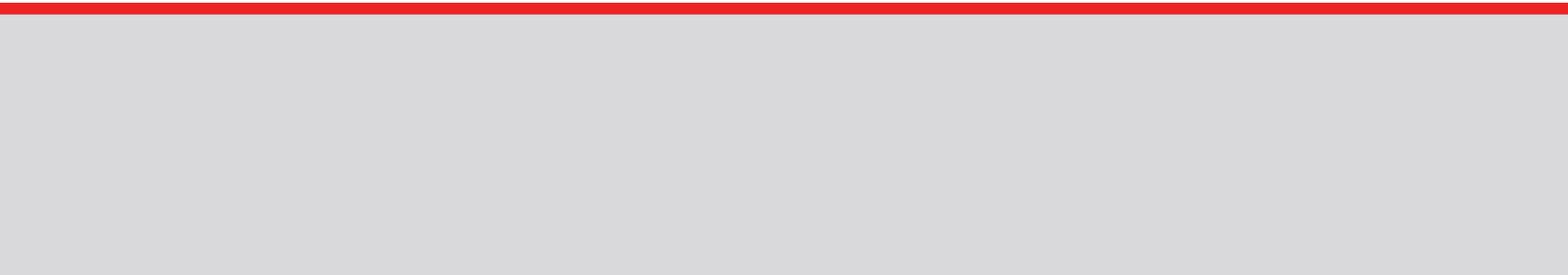
Characteristic of landforms resulting from quarrying activities, a void would remain at the site upon quarry closure. Holcim intends to rehabilitate the site with the aim of creating a landform, which is compatible with future land uses, in line with the objectives of the *Mid North Coast Regional Strategy* and the *Greater Taree Local Environmental Plan*.

SOUTH

NORTH



ENVIRONMENTAL
HERITAGE
PROJECTS\100171 Jandra Quarry\FIGURES\EA\100171 F11 Conceptual Quarry Bench Rehabilitation 27 06 2014 TO



Section 7

CONCLUSION





7 CONCLUSION

7.1 Overview

Holcim (Australia) Pty Ltd is seeking to modify the Jandra Quarry development consent (DA231-10-99) under Section 75W of the EP&A Act, to provide for an increase in production and transportation of finished quarry products to a maximum of 475,000 tonnes per calendar year.

The proposed intensification in production requires changes to the approved operations. Those changes that have the potential to result in additional environmental impacts include:

- Extension of operating hours to include weekday evenings (6:00 am to 10:00 pm Monday to Friday) and from 6:00 am to 6:00 pm Saturday, including the return of trucks from Newcastle haul to midnight. Refuelling, servicing and maintenance will also be extended from 9:00 pm to 10:00 pm on Saturdays;
- Asphalt production on a 24 hour campaign basis;
- Addition of a mobile crusher within the quarry pit to increase processing capacity;
- Increasing blasting frequency from approximately one blast per month to approximately two blasts per month;
- Increase in total vehicle movements;
- Construction of a new heavy vehicle access road, requiring clearing of 0.25 hectares of native vegetation, to separate inbound heavy vehicles from outbound heavy and light vehicles; and
- Expansion of the finished product stockpile area, requiring clearing of 1.034 hectares of native vegetation.

Specialist technical investigations were undertaken to assess medium to high risk environmental issues associated with the proposed intensification in production. For those environmental issues identified as low risk, further specialist technical investigations are not required as the proposed modification will not result in any additional impacts on these low risk environmental issues than what has already been assessed in the 1999 EIS and subsequent approved modifications.

The potential environmental impacts of the proposed modification have been identified and thoroughly assessed in Section 6. Table 27 provides a broad overview of the key outcomes of the environmental and social impact assessment for the proposed modification.

Table 27: Overview of Environmental and Social Impacts

Issue	Overview of Key Outcomes
Traffic and Transport	Although the proposed modification will result in an increase in the total number of vehicle movements per day, the number of vehicle movements in a maximum hour is unlikely to change. The traffic impact assessment concluded that the current Pacific Highway - Jandra Quarry Access Road intersection has sufficient capacity, is suitably configured and does not require upgrading, in order to safely accommodate the proposed modification.
Noise and Blasting	The noise and blasting impact assessment considered the potential impacts of the proposed modification on nearby sensitive residential receivers.

Issue	Overview of Key Outcomes
	<p>Noise levels (without asphalt production) below the early morning shoulder noise criteria, are predicted at all private residential receiver locations and for all stages of the quarry life, provided that operations are restricted during this time including:</p> <ul style="list-style-type: none"> ▪ No works in the approved overburden emplacement area; ▪ No works above RL50; and ▪ No operation of the mobile processing plant. <p>Noise levels (without asphalt production) above the day / evening criteria are predicted at three private residential receivers and range from a marginal 2 dBA to 5 dBA above the criteria. Holcim is confident that these noise levels will not be perceived as a nuisance and will negotiate agreements with the potentially affected property owners.</p> <p>Noise levels from asphalt production are up to 7 dBA above the criteria at one private residential receiver R1 during all periods and all stages of the quarry development, as this receiver has a line of sight to the asphalt plant. Holcim will pursue a negotiated agreement with the property holder of R1. If an agreement could not be negotiated with R1, compliance with the criteria could be achieved by constructing a noise barrier immediately east of the asphalt plant. The extent and height and location of the barrier can be determined during detailed noise control design process.</p> <p>The future change in road traffic noise levels associated with the proposal is predicated to be below the threshold criteria of +2 dBA and therefore no further investigations or controls are considered necessary.</p> <p>Noise levels are predicted to be below the project sleep disturbance criteria at all identified residential receiver locations with the implementation of the operational restrictions during the early morning shoulder periods.</p> <p>To control ground borne vibration and airblast to privately owned receivers, the MIC for blasts would not exceed the calculated MICs outlined in Table 15 (ensuring that the blasting criteria is met at the nearest receiver to all blasting locations). The MIC used on the northern benches during Stage 3 would be restricted to no greater than 125 kg in order meet the blasting criteria at the nearest receiver R1.</p> <p>Blasts would continue to be monitored at the closest private residence (in accordance with condition 45 of DA231-10-99 and the requirements of EPL 2796) in order to establish compliance with the blasting criteria.</p> <p>The levels of noise emitted from the quarry operations would continue to be monitored at the closest private residence (in accordance with the condition 44 of DA231-10-99 and the requirements of EPL 2796) in order to establish compliance with the noise criteria.</p>
Air Quality	The air quality impact assessment considered the potential impacts of the

Issue	Overview of Key Outcomes
	<p>proposed modification on nearby sensitive residential receivers.</p> <p>The air quality impact assessment concluded that with the implementation of existing and additional feasible management measures, all relevant air quality criteria could be met at all identified sensitive residential receivers for all stages of the quarry development.</p> <p>The odour concentration modelling results identified that the proposed new mobile asphalt plant that would be operated on a campaign basis, is unlikely to cause any odour nuisance at any surrounding sensitive receivers.</p>
Surface Water Management	<p>The proposed intensification in production will increase the demand for process water. A surface water management assessment was undertaken to review the existing stormwater management system at Jandra Quarry and its capacity to meet future process water demands and attenuate stormwater runoff and sediment.</p> <p>The assessment concluded that the site storage is capable of satisfying the quarry's current water demands. During all stages of the quarry development, water shortages may occur in extreme dry conditions (5th percentile year) for up to a month if maximum production and water use is maintained. However, up to 5 ML per annum can be extracted from the clean water dam under the Part 2 license granted as part of the existing development consent for Jandra Quarry. This back up water source may be relied upon in the event of extended drought conditions and provides sufficient water to meet the expected deficit in non-potable water required. Increasing the pit dam storage can also improve stormwater harvesting yields during dry periods. This is a feasible option for improving stormwater storage as the pit dam will need to be re-established during each stage of the quarry development as the depth and size of the quarry pit changes.</p> <p>The surface water management assessment considered the relevant provisions of the Water Act and Water Management Act as they relate to controlled activity approvals and water extraction license requirements. The assessment concluded that the proposed modification would not require further approvals or licences under these respective Acts as long as the extraction of water from the clean water dam does not exceed the existing license threshold of 5 ML per annum.</p> <p>With the implementation of surface water management measures included in the Soil and Water Management Plan, the EPL and this EA, the proposed modification would not result in any significant impacts on the downstream environments.</p>
Flora and Fauna	<p>The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area will be located on land that falls outside of the approved disturbance area. Construction of this new infrastructure will involve the clearing of a total of 1.284 hectares of native vegetation and ground disturbance.</p>

Issue	Overview of Key Outcomes
	<p>The proposed intensification in production would also expose fauna that inhabit the bushland that surrounds the Jandra Quarry, to longer periods of noise and lighting and increased risk of road-kill.</p> <p>The flora and fauna impact assessment, which included two targeted surveys for threatened flora as well as a Koala survey provided the following conclusions:</p> <ul style="list-style-type: none"> ▪ The proposed modification will not impact on: <ul style="list-style-type: none"> - Endangered Ecological Communities; or - Threatened fauna species; ▪ The proposed modification will not result in a significant impact on threatened flora. However the Eastern Underground Orchid could not be surveyed for as it is an underground species that can only be detected when it flowers in spring. The Eastern Underground Orchid is currently known from fewer than 10 locations, but has been recorded less than 40 km away in the Bulahdelah area and given the potentially suitable habitat on site, it has the potential to be present. If present, any impact could be considered to be significant based on the few known locations for the species and therefore very small population size. <p>OEH advised in a phone conversation on the 26th of June 2014 that a (Section 5A) seven part test and EPBC Assessment should be undertaken for the Eastern Underground Orchid with it being presumed to be present in the proposed disturbance area. These assessments concluded that there is likely to be a significant impact on the Eastern Underground Orchid if it was found to be present.</p> <p>It is therefore recommended that a targeted survey is undertaken for this species between September and November, in order to establish if the Eastern Underground Orchid is present in the proposed disturbance area. Should this species be detected, then Holcim would liaise with the relevant authorities regarding mitigation and management of impacts;</p> <ul style="list-style-type: none"> ▪ The study area contains Koala feed trees at a suitable density to be potential core Koala habitat. However the lack of records from previous surveys, the paucity of database records within 20km of the study area, and the failure to locate any individuals or definite signs of Koala presence during the site survey, all indicate that there is not a breeding population of the Koala present within the study area. Consequently, the study area does not contain core Koala habitat, there is no evidence of koala breeding activity or any form of resident population and therefore this species does not require further consideration or assessment; ▪ The proposed new disturbance area contains seven hollow-bearing trees that would be removed. The impacts of the removal of hollow-bearing trees would be mitigated through the inclusion of nesting boxes, at a ratio of 2:1 for every hollow removed; ▪ There is unlikely to be any significant increase in fauna road-kills and the

Issue	Overview of Key Outcomes
	<p>increase in fauna exposure to operational noise, light and dust is not significant.</p> <p>With the implementation of flora and fauna management measures included in the Flora and Fauna Management Plan and this EA, (depending on the outcome of the targeted surveys for the Eastern Underground Orchid) the proposed modification would not result in any significant impacts on biodiversity on site and in surrounding bushland.</p>
Heritage	<p>The proposed new heavy vehicle access road and expansion of the existing finished product stockpile area will be located on land that falls outside of the approved disturbance area.</p> <p>The Aboriginal heritage due diligence assessment concluded that no Aboriginal or historic heritage objects / sites are located within the new disturbance area and therefore the proposed modification would not result in any heritage impacts.</p> <p>Aboriginal heritage sites within the development consent boundary will continue to be managed in accordance with the Aboriginal Heritage Impact Permit, and the Jandra Quarry Environmental Management Plan.</p>
Greenhouse Gases	<p>A GHG emissions assessment was undertaken to quantify the increase in GHG emitted as a result of the proposed modification and to identify actions for mitigating or reducing emissions, where possible.</p> <p>The GHG emissions assessment concluded that although the proposed intensification in production will increase annual GHG emissions, the extractive resource is being extracted in a shorter time period and therefore the total emissions associated with the production and transportation of quarry products, will not increase over the life of the quarry.</p> <p>Possible GHG management actions have been recommended to reduce annual GHG emissions from the quarry operations.</p>
Socio Economic	<p>The Jandra Quarry has been operating since 1986 without significant adverse impact on surrounding land uses or socioeconomic environment. With the exception of odour from the previous old asphalt plant (since decommissioned), there are no recorded complaints from neighbouring landowners. Holcim maintains a positive relationship with all Jandra Quarry neighbours and the Quarry Manager has an open door policy, welcoming any feedback on the quarry operations.</p> <p>The potential social impacts of the proposal relate largely to impacts on general amenity such as noise and blasting, air quality (dust), surface water runoff and traffic. These potential social impacts have been thoroughly assessed in the EA and a range of mitigation measures (in addition to those presented in the 1999 EIS and Jandra Quarry Environmental Management Plan) are recommended to minimise potential noise, air quality and surface water impacts so they are not perceived as a nuisance to neighbouring</p>

Issue	Overview of Key Outcomes
	<p>residences.</p> <p>The economic benefits of the proposed modification include a net increase in employment opportunities (both during construction and operational phases); construction expenditure of \$65,000; flow on and multiplier effects as a result of the additional capital investment and ongoing expenditure injection into the economy; increased operational expenditure of \$838,000 per annum; and tax revenue and royalties to State and Commonwealth governments.</p> <p>Based on the estimated construction capital value of \$65,000, the proposed modification will generate economic value (direct and indirect benefits) to the state and nation in the order of \$186,290.</p> <p>The injection of an additional \$838,000 into the economy annually in the form of the increased operating budget of the quarry has the direct and flow on impact of generating \$1,751,420 additional value to the economy.</p> <p>In summary, the proposed intensification in production at Jandra Quarry will generate employment and economic benefit for the local community as well as the wider region.</p>
Flooding and Groundwater	<p>The Jandra Quarry site and the areas affected by the proposed modification, do not fall within flood prone land and are therefore unlikely to be impacted by flood events.</p> <p>The existing quarry is not subject to groundwater inflow and no groundwater was recorded by the geological investigations undertaken for the 1999 EIS.</p> <p>Relatively shallow earthworks excavations, required for the construction of the proposed new heavy vehicle access road and expansion of the existing finished product stockpile area, are therefore highly unlikely to impact on groundwater.</p> <p>The proposal will not result in any changes to the approved quarry pit in terms of both depth and disturbance area.</p> <p>Further consideration of flooding and groundwater is therefore not required in assessment of the potential environmental impacts associated with the proposed modification.</p>
Land Contamination	<p>Potential to encounter or disturb areas of contamination are low with historical land uses (prior to the commencement of quarrying operations) being forested bushland surrounded by agriculture. Holcim are also unaware of any potential contaminating activities that have been undertaken within the proposed new ground disturbance area.</p> <p>An EPA Contaminated Land Record search was undertaken in February 2014 and no sites were recorded within the Greater Taree LGA.</p> <p>Six separate site surveys were undertaken during the EA process, of the proposed new disturbance area (Aboriginal heritage survey, two flora and</p>

Issue	Overview of Key Outcomes
	<p>fauna surveys and three general site visits) and no evidence of contamination or potentially contaminating activities were identified. In the event that previously unidentified contaminated land is located during construction, relevant statutory requirements would need to be complied with. As such no further assessment of contaminated land or land remediation is required.</p>
Visual Amenity	<p>A visual impact assessment was undertaken as part of the 1999 EIS. The potential visual impacts of the quarry that were identified included:</p> <ul style="list-style-type: none"> ▪ Minor impacts on existing residential properties; ▪ An increase in the exposure of the quarry face when viewed from vehicles travelling in a southerly direction along the Pacific Highway. The time of exposure along the Pacific Highway was determined to be limited; and ▪ Negligible impact from the Taree lookout facility and Fire Tower. <p>The construction of the new heavy vehicle access road and expansion of the finished product stockpile area are the only proposed changes to the approved disturbance area. This proposed new infrastructure will be located immediately adjacent to the approved site facilities area and will be screened from all surrounding residential properties by existing vegetation and topography.</p> <p>The proposal will not result in any significant changes to the visual impacts predicted in the 1999 EIS. No further assessment of potential impacts on the visual amenity is required.</p> <p>Holcim will continue to manage visual impacts in accordance with the existing Landscape and Rehabilitation Plan.</p>
Rehabilitation and Closure	<p>A Landscape and Rehabilitation Plan was prepared for the site as part of the 1999 EIS. Progressive implementation of the Landscape and Rehabilitation Plan will produce a stable landform, which is compatible with the surrounding area.</p> <p>With the proposed intensification in production, the quarry is expected to have a minimum lifespan of approximately 29 years. However it is not proposed to increase extraction of the overall resource. Therefore no additional extraction areas, outside the approved quarry pit disturbance area, need to be considered as part of the approved rehabilitation and closure strategy.</p> <p>The proposed heavy vehicle access road and expansion of the finished product stockpile area will form part of the site facilities area and will be rehabilitated with the rest of the approved quarry operational areas in accordance with the Landscape and Rehabilitation Plan outlined in the 1999 EIS and included in the Jandra Quarry Environmental Management Plan.</p> <p>As was the case when preparing the rehabilitation management plan for the quarry in the 1999 EIS, it is impossible to predict accurately the likely future land use at the site, given the substantial changes expected to occur in the</p>

Issue	Overview of Key Outcomes
	region over the next 30 years. Future land use will need to consider the applicable planning policy framework as well as the surrounding land use and environmental and market conditions at the time.

As outlined in this EA, the proposed modification is unlikely to result in any significant impacts on either the biophysical or social environment with the implementation of:

- Environmental management and mitigation measures outlined in:
 - The Jandra Quarry Environmental Management Plan;
 - This EA report;
- Requirements of the EPL;
- Conditions of development consent (DA231-10-99).

7.2 Benefits of the Proposed Modification

The proposed modification has the potential to result in the following positive economic benefits:

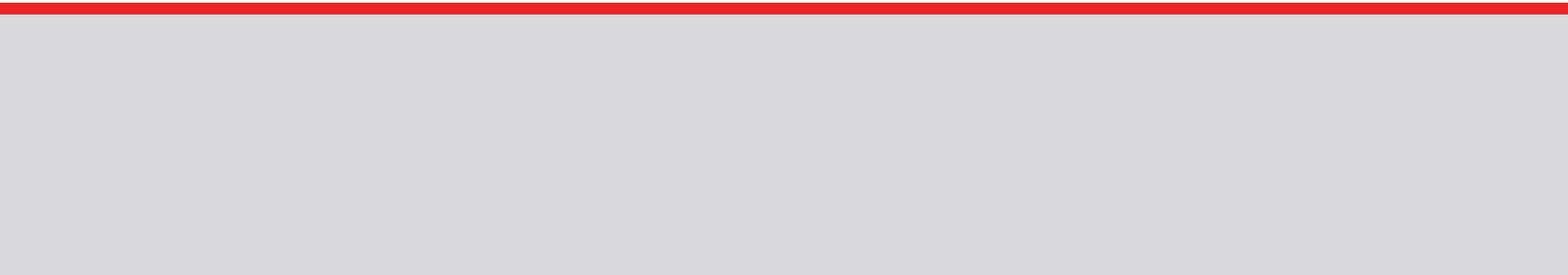
- Uninterrupted supply of essential construction materials to local and regional development projects at cost-effective prices;
- Employment of an additional three full time employees and three truck/transportation drivers, with further jobs created through flow-on effects;
- Contribution to the economy of \$186,290 in direct and indirect benefits from construction works and \$1,751,420 in ongoing operational costs;
- Optimal use of a regionally-significant resource; and
- Economic benefits to the local community through the purchase of goods and services and local expenditure both directly and indirectly through employee wages.

The proposed modification offers a net economic benefit to the NSW economy.

Section 8

REFERENCES





8 REFERENCES

Bendow Environmental 2010, Environmental Monitoring Report;

CSR Readymix 2002, Jandra Quarry Statement of Environmental Effects for Enlargement of an Overburden Emplacement Area;

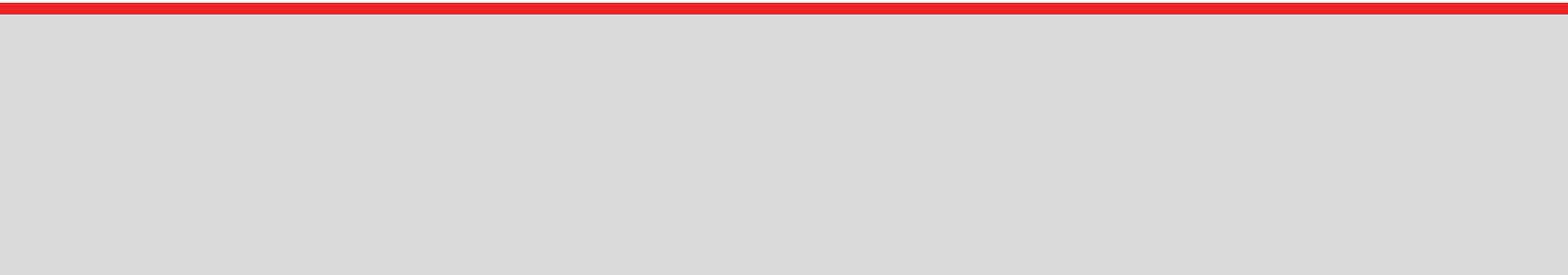
Environmental Resources Management Australia 1999, Jandra Quarry Extension - Environmental Impact Statement;

Environmental Resources Management Australia 2000, Jandra Quarry Environmental Management Plan;

Greater Taree Local Environmental Plan 2010;

Minister for Urban Affairs and Planning 2000, Development Consent No. 231-10-99 (including amendments dated 2002, 2007 and 2012);

Umwelt 2012, Jandra Quarry Clarification of Production and Transportation Limits Environmental Assessment.



Section 9

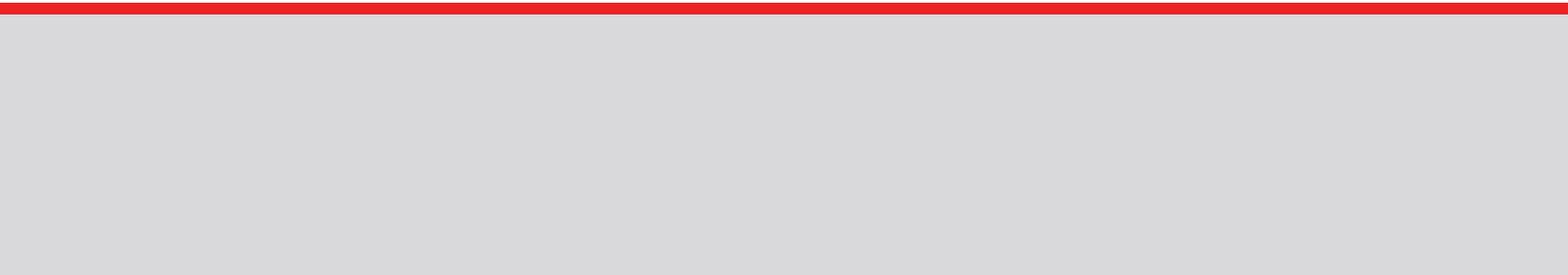
ABBREVIATIONS





9 ABBREVIATIONS

Abbreviation	Definition
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ANZECC	Australian and New Zealand Environment and Conservation Council
BOM	Bureau of Meteorology
CLM Act	Contaminated Lands Management Act, 1997
DA	Development Application
DECCW	Department of Environment Climate Change and Water (now OEH)
DP	Deposited Plan
DP&I	The Department of Planning and Infrastructure, NSW
EA	Environmental Assessment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environment Protection Authority
EP&A Act	The NSW Environmental Planning and Assessment Act 1979
EP&A Regulation	The NSW Environmental Planning and Assessment Regulation 2000
EPBC Act	Commonwealth Environmental Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence
HFC	Hydrofluorocarbon
ICNG	Interim Construction Noise Guideline (DECC 2009)
INP	Industrial Noise Policy
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
MOD	Modification
Mt	Million Tonnes
NGERS	National Greenhouse and Energy Reporting Scheme
NPI	National Pollutant Inventory
NPW Act	National Parks and Wildlife Act 1974
NSW	New South Wales
NT Act	Native Title Act 1993
NV Act	Native Vegetation Act 2003
OEH	Office of Environment and Heritage
PM _{2.5}	Particulate matter less than or equal to 2.5 micrometres in aerodynamic diameter
PM ₁₀	Particulate matter less than or equal to 10 micrometres in aerodynamic diameter
POEO Act	Protection of Environment Operations Act 1997
RNP	NSW Road Noise Policy (EPA 2011)
RMS	NSW Roads and Maritime Services
SAT	Spot Assessment Technique
SEPP	State Environmental Planning Policy
SWL	Sound Power Level
SWMP	Soil and Water Management Plan
tpa	Tonnes Per Annum
TSC Act	Threatened Species Conservation Act 1995
TSP	Total Suspended Particulate
WM Act	Water Management Act 2000



Plates



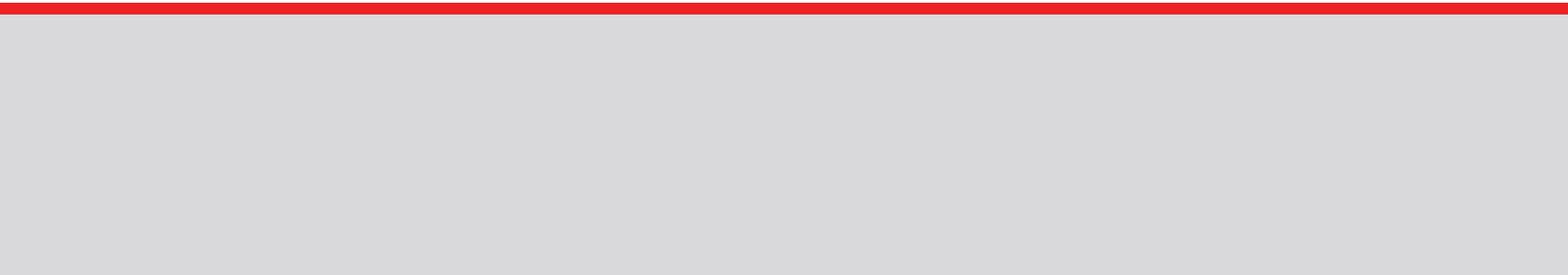




Plate 1: View towards the eastern edge of the finished product stockpile area. It is proposed to expand the stockpile area eastwards, which will require clearing of the vegetation in the background.



Plate 2: View eastwards from the western edge of the quarry. Note the pit dam and the processing plant in the background.



Plate 3: View of the southern quarry face showing the rehabilitated RL 98 top bench.



Plate 4: The pit dam. A sump created in the floor of the quarry to capture sediment laden stormwater runoff from the quarry pit.



Plate 5: View south over the main dam.



Plate 6: View south of the finished product stockpile area, processing plant and southern quarry face.



Plate 7: View south, from the north eastern corner of the main dam along the proposed alignment of the new heavy vehicle access road (to be located between the existing unsealed haul road and the main dam).



Plate 8: Typical vegetation cover along the proposed new heavy vehicle access road alignment.