GROUNDWORK plus

CORAKI QUARRY
ENVIRONMENTAL IMPACT STATEMENT

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Executive Summary

Quarry Solutions Pty Ltd (Quarry Solutions) propose to establish the Coraki Quarry (the project), to be located at Seelems Road and Petersons Quarry Road, Coraki, New South Wales. The site is located approximately 2.5 kilometres to the north west of Coraki, on the Far North Coast of New South Wales (NSW).

The project would extract a maximum of 1,000,000 tonnes per annum, primarily for the planned upgrade of the Woolgoolga to Ballina – Pacific Highway upgrade project (Pacific Highway upgrade project) and thereby support and enhance the economic viability of the region. Consent is being sought for a period of 7 years. Accordingly, the project satisfies the criteria for State Significant Development (SSD) pursuant to the *State Environmental Planning Policy (State and Regional Development) 2011* and therefore requires development consent under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

It is understood that the Pacific Highway upgrade project will require in the order of 1,230,000 tonnes of roadbase and 1,400,000 tonnes of aggregate. Resource investigations have confirmed that the site contains in the order of 2,900,000 million tonnes of unweathered high quality basalt suitable to supply a significant proportion of the construction materials requirements for the Pacific Highway upgrade project. As a result, it is anticipated that the project will provide a significant economic benefit to the local area and region by providing a supply of high quality construction materials thereby avoiding the need to exhaust other local quarry reserves required for the long term supply for local projects. The project will also contribute to local employment and training opportunities through direct and indirect employment opportunities, including creation of new project specific positions, in addition to non-direct employment growth for local businesses supplying goods and services to the project. There would also be significant operational efficiency and quality assurance benefits for the Pacific Highway upgrade project if the majority of construction materials were sourced from a single quarry rather than multiple smaller reserves. Material test results confirm that the resource meets the relevant NSW Roads and Maritime Services (RMS) specifications for the quarry products proposed to be produced from the resource.

The project has been designed to avoid impacts to the environmental values of the site where practicable and minimise any remaining potential impacts through appropriate design and management measures. A thorough and comprehensive assessment of existing environmental values and potential environmental impacts have been undertaken enabling preparation of a detailed Environmental Management Plan (EMP) to guide the day to day operation of the project.

Assessment of the project determined that archaeology and historic heritage, traffic, biodiversity, noise and air quality, vibration and surface water were key aspects of the project which could potentially cause environmental impacts. Accordingly, these matters were considered by further detailed specialist assessment reports. The assessments of heritage and biodiversity found that the project would avoid areas of significance and would require only minimal management measures to minimise and mitigate the risk of potential impacts. Whereas, the assessment of noise and air quality, vibration and surface water identified a comprehensive range of management measures should be implemented to minimise and mitigate the risk of potential and cumulative environmental impacts. The assessment of potential traffic impacts determined that the proposed haul route had sufficient capacity to cater to the project and existing background traffic without requiring intersection or road upgrades.

This Environmental Impact Statement (EIS) has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the Secretary of the Department of Planning and Environment on 22 May 2015 and revised on 30 July 2015 (refer Attachment 1). The preparation of the EIS has incorporated a process involving, assessment of the environmental values of the site, consultation with government agencies and adjoining land owners and completion of expert technical assessments.

Sufficient assessment of the project has been undertaken through the preparation of the EIS, and as such it is recommended that the project be approved. The project will avoid and minimise potential impacts to a degree that will enable significant economic and operational benefits to be sustainably achieved.

1. Introduction

Groundwork Plus has been commissioned to prepare this EIS on behalf of Quarry Solutions. The EIS has been prepared in relation to the project, to be located at Seelems Road and Petersons Quarry Road, Coraki, New South Wales (refer Figure 1 and Drawing No. 1837.DRG.007R1 Site Location Plan). Extraction is proposed to primarily occur within Lot 401 DP633427 (Lot 401). Stockpiling and processing will occur on Lot 401 as well as the adjacent Petersons Quarry (refer Figure 2 and Drawing No. 1837.027 Conceptual Site Layout Plan). An Environmental Management Plan (EMP) has been prepared for the project (refer Attachment 2).

Due to anticipated demand for construction materials associated with the Pacific Highway upgrade project, Quarry Solutions propose to establish the project to supply materials on a project basis. It is anticipated that the project will extract a maximum of 1,000,000 tonnes per annum. Consent is being sought for a period of 7 years.

The project would provide operational efficiencies and quality assurance benefits for the Pacific Highway upgrade project in comparison to the logistics of sourcing the required construction materials from multiple smaller resources spread throughout the region. The project would provide the additional economic benefit of preserving the other smaller resources for their long term use for local projects.

Although the project incorporates land associated with the existing Petersons Quarry, it is not intended that the project approvals will replace the existing Petersons Quarry development consent or Environment Protection Licence (EPL) as it is required for continued supply of construction materials to the local market (including Richmond Valley Council) on an on-going basis. Accordingly, a separate consent and EPL is sought for the project from those held for the existing Petersons Quarry.

It is important to note that Quarry Solutions has been granted a lease by the Richmond Valley Council to operate the Petersons Quarry. The Petersons Quarry is subject to a consent and EPL of significant age and limited conditions. Accordingly, it is known that the project will be subject to more stringent and comprehensive regulatory requirements and conditions. As a result, to the extent that the Petersons Quarry will continue operation during the life of the project, it will be operated to a standard consistent with the regulatory requirements imposed on the project. This approach will ensure that environmental management and monitoring of the operations of the project will be consistent. In essence, the Petersons Quarry will become part of the day to day operation of the project for the life of the project with the exception that the project will not rely upon the extractive resource within the Petersons Quarry which is to be retained for the future use of the local region and not for supply to the Pacific Highway upgrade project.

Adopting this approach to the regulatory requirements of the project is consistent with the assessment of noise, dust, surface water and traffic impacts undertaken for this EIS which have considered the cumulative impacts of the continuation of the Petersons Quarry for the life of the project.

1.1 The Applicant

The applicant is Quarry Solutions Pty Ltd a subsidiary of SEE Civil Pty Ltd (SEE Civil) an innovative company committed to delivering excellence in all areas of business. Established in 1988, and with over 25 years of experience in civil construction, material processing and quarry operations, it has become a successful Australian owned company. SEE Civil owns and operates its own quarries under Quarry Solutions as well as an extensive range of mobile crushing and screening plant and equipment.

1.2 Purpose and Scope of the Document

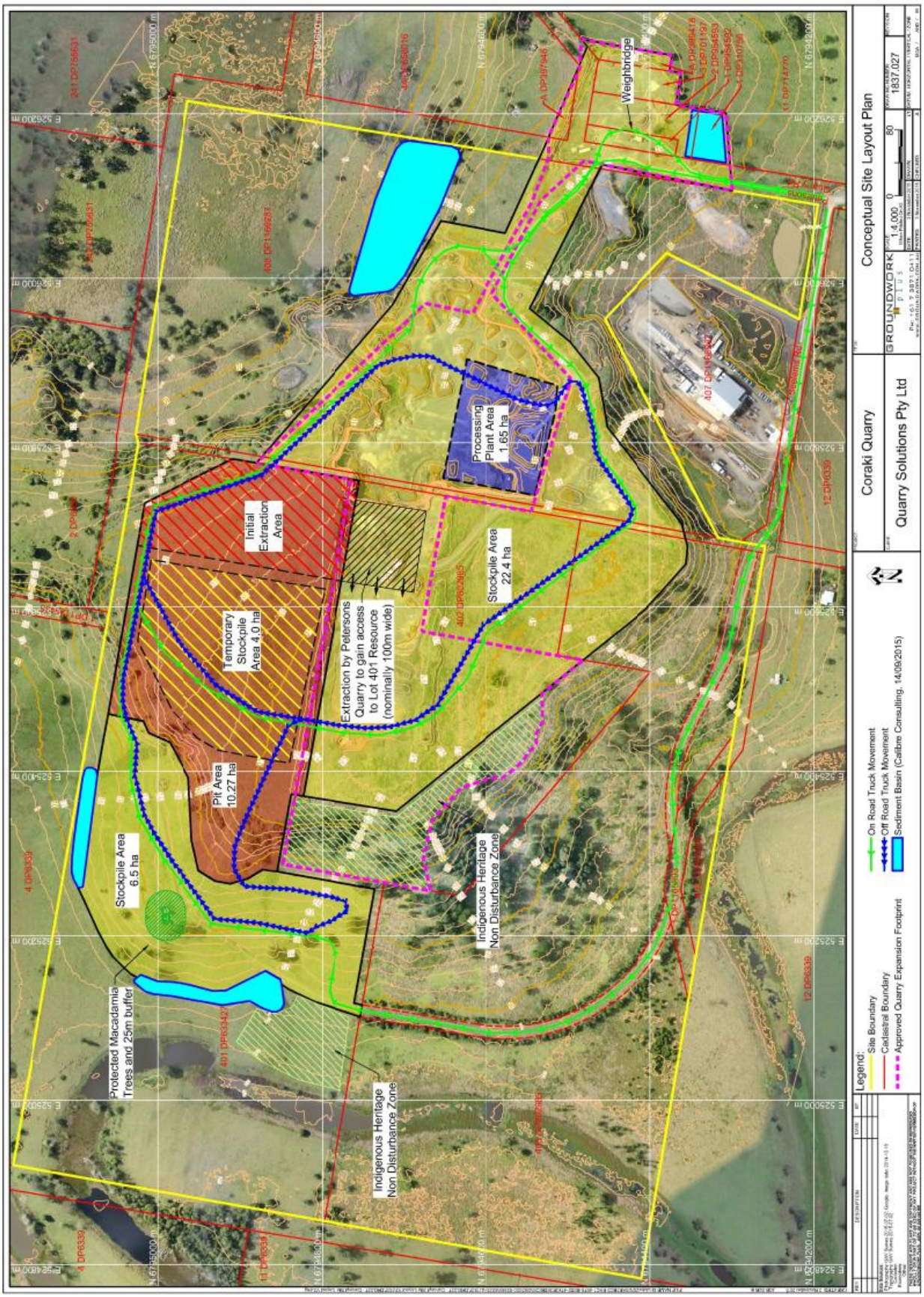
The project is classified as State Significant Development (SSD) under the *State Environmental Planning Policy (State and Regional Development) 2011*. This EIS accompanies the development application for SSD, in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act). The EIS has been prepared in accordance with the SEARs issued on 22 May 2015 and revised on 30 July 2015. The NSW State Government is the consent authority, in consultation with the Richmond Valley Council. This EIS addresses the following matters:

- The location and nature of the project
- A review of the environmental impacts associated with the construction, operation, decommissioning and rehabilitation of the project
- Recommendations to control and mitigate potential impacts
- An outline of how the applicant will meet its obligations under relevant legislation and policies
- An outline of the environmental assessment process for the proposal for the consent authority's consideration in providing consent for the proposal.

Under Section 79C of the EP&A Act, the proposal must be evaluated against a range of considerations including environmental planning instruments, the EP&A Regulation, the likely environmental, social and economic impacts of the development, the suitability of the site, and the public interest.

Figure 1 Site Location Plan

Figure 2 Conceptual Site Layout Plan



2. Objectives of the Proposal and Consideration of Alternatives

2.1 Objectives of the Proposal

The objectives of the proposal are to establish the project to realise the full potential of a known extractive resource (hard rock), and establish an ecologically sustainable development which minimises impacts on the natural and built environment through sensitive design and appropriate environmental management practices. The project seeks to extract a maximum of 1,000,000 tonnes per annum, for supply to the Pacific Highway upgrade project and thereby support and enhance the economic viability of the region.

2.2 Need for the Project, Alternatives and Options Considered

Quarried products are used in the building and construction industries and are essential components for providing shelter and infrastructure. The quarry industry is market driven and therefore is focused on price, quality and service. The industry is dominated by a few large, national, vertically integrated companies. However, independent operators such as Quarry Solutions provide market choice and special services and contribute significantly to the vitality and strength of local businesses and industry.

Extractive industries are a significant contributor to the material needs of local and regional communities and to economic activity and development. Extractive resources are site specific, limited in occurrence by geological conditions and are finite. Because they are high-volume, low-cost materials, they need to be located close to the communities that use them as the cost of transport to the end user contributes greatly to the overall cost of the delivered product. Extractive resources underpin all urban and infrastructure development and make a major contribution to the ongoing economic growth of the community through direct and indirect employment opportunities.

Cement Concrete & Aggregates Australia (CCAA), notes in its document, 'A strong foundation for New South Wales' future', (CCAA 2015) that,

- "NSW is Australia's largest State with a population of 7.5 million people".
- "As our state grows there will be a need for improved connectivity through enhanced transport options including roads, rails, ports and airports."
- "Each kilometre of a typical 2 lane asphalt highway requires approximately 14,000 tonnes of crushed rock or about 400 truckloads of material."
- "An average new house requires 110 tonnes of crushed rock, sand and cement and 54 cubic metres of concrete".
- "Heavy construction materials are geologically constrained and required in high volumes to build the State's priority infrastructure. It is the foundation of the building and construction industry, which is vital to the New South Wales economy."

The NSW RMS identified the construction material requirements for the Pacific Highway upgrade project in the EIS prepared for that project (RMS 2012). Specifically, Section 6.4 of the EIS identified an estimated demand of 1,230,000 tonnes of roadbase and 1,400,000 tonnes of aggregate. The RMS rightly identified that '*Quarry outputs are restricted by the licence for the facility*' and commented that some materials may need to be sourced from further afield if not available in the required volume locally. As such there is a known need for the construction materials that can be supplied by the project.

It is understood that RMS and Pacifico (the delivery partner for the Pacific Highway upgrade project) have not yet confirmed the full detailed materials specifications for the Pacific Highway upgrade project. However, it is anticipated that the specifications will be particularly stringent given the safety improvements being sought and will be similar to existing RMS specifications. Accordingly, it can be expected that not all quarries in the region will have resources which comply with the specifications for the Pacific Highway upgrade project which will further narrow the number of available and viable sources.

2.2.1 Option 1 – Do nothing

The 'do nothing' option would not satisfy the proposal objectives and would not allow for the establishment of the project. This option would rely upon the availability of suitable quality materials in the necessary volumes from existing quarries in the region introducing project risk associated with consistency of product, operational hours, output capacity and varying haulage routes. This option could result in significant adverse economic impacts to the Pacific Highway upgrade project through delayed delivery of construction materials, or the cost of transporting additional material from outside of the region.

2.2.2 Option 2 – Alternative proposal

Increasing the annual extraction limit of the adjoining Petersons Quarry was considered as an alternative to the project. However, this option was considered unfavourable as the Petersons Quarry is required to provide a secure long term supply of construction materials for the Richmond Valley Council and the local community. Accelerated extraction of the Petersons Quarry resource to the Pacific Highway upgrade project would significantly reduce the operating life of the quarry and impact its availability for long term supply to local construction projects including local road projects. It was also noted that the Petersons Quarry is constrained by higher environmental values than those identified for Lot 401.

2.2.3 Option 3 – Coraki Quarry Project

The preferred and chosen option is to proceed with the proposed project which includes extraction of a maximum of 1,000,000 tonnes per annum from Lot 401. The site is considered to hold a high quality basalt resource capable of meeting a majority of the construction materials demand for the Pacific Highway upgrade project. Particularly being informed by a resource assessment which indicates that the material should be suitable for use as high quality roadbase, concrete aggregate, sealing aggregate and asphalt aggregate pending appropriate supporting material testing.

2.2.4 Justification of the preferred option

Option 3 is the preferred option and is considered to be the most appropriate in terms of balancing commercial viability with environmental impacts and outcomes in accordance with the principles of ecologically sustainable development. Option 3 is considered more favourably given that a sufficient level of scientific certainty can be reached to confirm potential impacts to the limited biodiversity values of the site can largely be avoided and other potential impacts to surrounding land uses can be mitigated through a range of typical management measures commonly employed for quarry operations. Option 3 also addresses inter-generational equity by preservation of the resource within the Petersons Quarry for long term supply to local construction projects including local road projects.

2.2.5 Design refinements

An iterative design process has been employed to design the project which has resulted in numerous revisions to the site layout. The following revisions to the site layout have been made in order to first avoid and then minimise potential environmental impacts:

- A buffer of at least 40m will be maintained to the watercourse in the west of the site.
- The operational areas of the quarry will be designed to be outside portions of the site identified as being at risk to flooding.
- A perimeter bund will be installed to the processing and stockpile area to minimise potential noise, dust and visual amenity impacts.
- A buffer of 25m will be provided to the *Macadamia tetraphylla* – Rough-shelled Bush Nut on Lot 401.
- Incorporation of the Petersons Quarry land to enable extraction to proceed from the existing Petersons Quarry pit through the adjoining property boundary into Lot 401 minimising environmental impacts by retaining the existing topographic screening provided by the existing Petersons Quarry pit.
- Incorporation of the Petersons Quarry land for establishment of the processing plant required for the project, minimising noise and amenity impacts as the proposed location is topographically screened within the existing Petersons Quarry pit.

- Incorporation of the Petersons Quarry land for stockpiling achieving stockpiling capacity of up to 1,000,000 tonnes, minimising offsite impacts and providing for improved logistical delivery of materials to the Pacific Highway upgrade project.
- Incorporation of the Petersons Quarry land facilitating a one way on-road and off-road traffic flow system improving operational efficiency and safety for quarry staff and haulage contractors.
- Establishment of Indigenous Heritage Non Disturbance Zones including an area within Lot 401 adjacent to Seelems Creek.

3. The Proposal

3.1 Location and Site Description

3.1.1 Location and site context

The site is located at Seelems Road and Petersons Quarry Road, Coraki NSW 2471, including Lot 401 and land associated with the existing Petersons Quarry. The site is located approximately 2.5 kilometres to the north west of Coraki, on the Far North Coast of New South Wales. Coraki has a population of approximately 2,000 people, situated approximately 720 kilometres north of Sydney and 240 kilometres south of Brisbane.

Land use directly adjacent to the site is rural in nature, predominantly consisting of cattle grazing. The land in the locality has been extensively cleared for grazing purposes. Several farm sheds are scattered on neighbouring properties. Residential development in the vicinity of the site is extremely sparse but includes a number of dwellings to the east on Spring Hill Road, Coraki and also a dwelling to the south on Lagoon Road (refer Figure 3 and Drawing No. 1837.DRG.002R1 Site and Surrounds). The closest residences to the proposed extraction area are located approximately 335 metres to the north, 820 metres to the east and 595 metres to the south (refer Figure 4 and Drawing No. 1837.DRG.037 Nearby Sensitive Receptors) of the proposed extraction area.

Lot 407 on DP1166287, south of the site, is an existing industrial operation. The industrial operation was initially approved by consent in 1997 and includes the manufacture of pre-cast concrete panels and structures for bridges, road construction and other building activities and is now known as the Doolan Deck Factory. It is understood the industrial operation relies upon premixed concrete sourced from the general market and does not rely on quarry materials directly from the existing Petersons Quarry or the project.

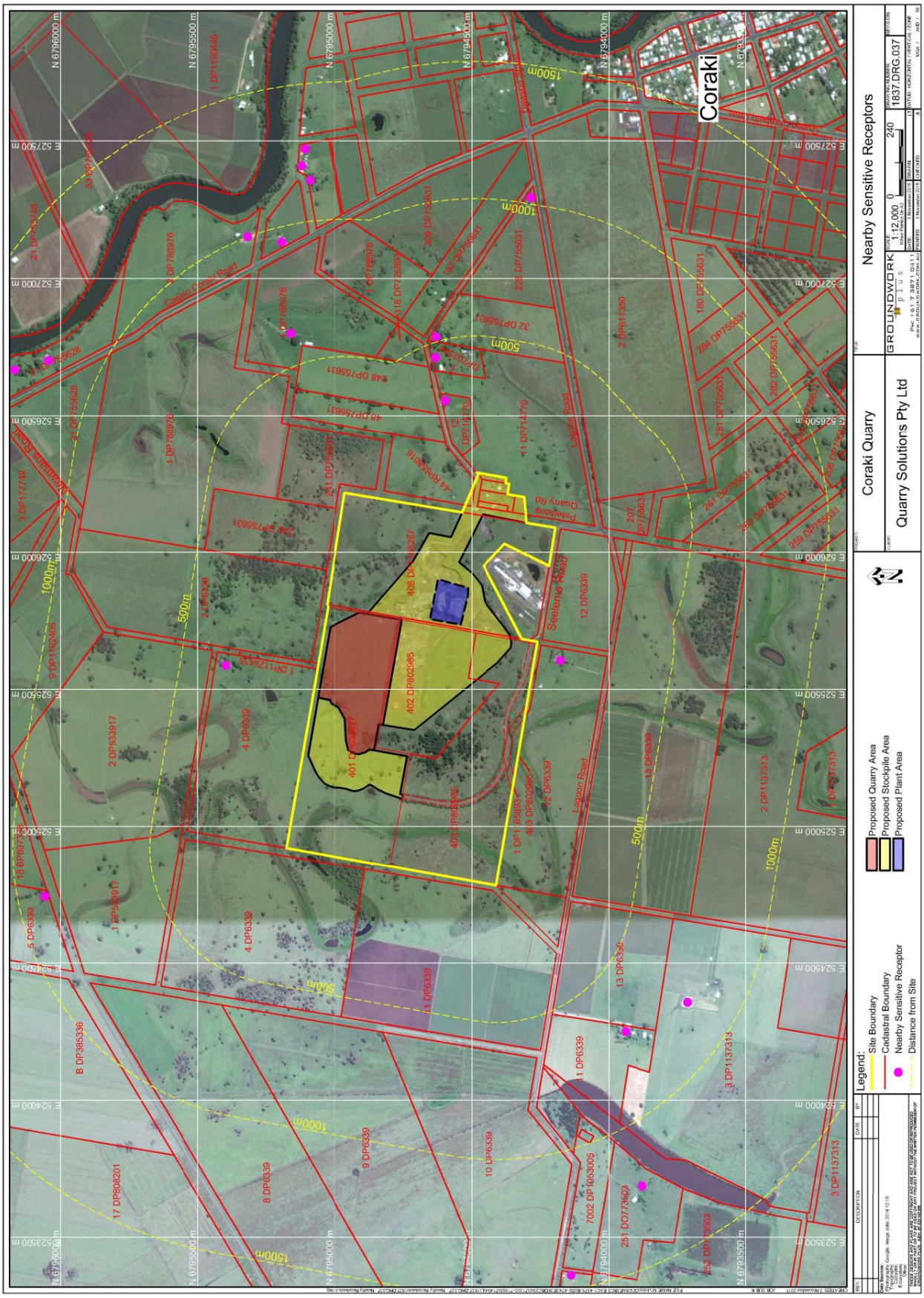
Petersons Quarry, owned by Richmond Valley Council and forming part of the land for the project, has been in operation since 1916 supplying quarry materials for road construction and for private sale. Quarrying operations have been undertaken in response to demand, with operations typically undertaken two or three days of the week. The Petersons Quarry is operated pursuant to Environment Protection Licence (EPL) No. 3397 which has now been transferred from Richmond Valley Council to Quarry Solutions.

3.1.2 Site details

Access:	Access to the project is via Seelems Road and Petersons Quarry Road.
Site:	Lot 401 DP633427, Lot 402 DP802985, Lot 403 DP802985, Lot 408 DP1166287, Lot A DP397946, Lot A DP389418, Lot 3 DP701197, Lot 2 DP954593, Lot 1 DP954592 and Lot 1 DP310756.
Tenure:	Freehold
Registered Proprietor:	· Varoli Pty Ltd (ACN 003728229): Lot 401 DP633427 · Richmond Valley Council: Lot 402 DP802985, Lot 403 DP802985, Lot 408 DP1166287, Lot A DP397946, Lot A DP389418, Lot 3 DP701197, Lot 2 DP954593, Lot 1 DP954592, and Lot 1 DP310756.
Current Land Use:	The site is currently used for cattle grazing and the existing Petersons Quarry.
Local Government Area:	Richmond Valley Council.

Figure 3 Site and Surrounds

Figure 4 Nearby Sensitive Receptors



3.1.3 Description of existing environment

Regional Climate:

The site is within the Richmond River Catchment and is centred approximately 2.5km north west of Coraki, and 16km south-south west of Lismore. The region is subject to a humid subtropical climate with mild to warm temperatures all year round and ample rainfall.

There is a Bureau of Meteorology Weather Station located at Union Street, Coraki with rainfall records dating back to 1895 but limited other information. Review of the Union Street records confirms most rain falls between December and April. The driest month is September. The annual mean rainfall is about 1,285 mm.

Temperature data was not available for the Union Street, Coraki weather station. Accordingly, Lismore was adopted as a suitable representative of regional climatic conditions rather than Ballina on the following basis. Lismore is approximately 20km NNW of the site. Ballina is approximately 30km ENE of the site. Mean monthly maximum temperatures are highest in January (about 29.9°C) and lowest in June and July (about 20.7°C). Mean minimum temperatures drop to 6°C in July. A summary of the Regional Climatic Statistics is shown in Table 1 below:

Table 1 – Summary of Regional Climatic Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall (mm)													
Mean	146.7	160.9	173.6	128.1	114.7	100.0	76.2	54.8	48.7	71.9	89.8	117.6	1285
Temperature (°C)													
Mean min.	18.8	18.6	16.9	14.1	9.6	8.0	6.0	6.6	9.7	12.7	15.5	17.4	12.8
Mean max.	29.9	29.2	28.1	25.8	23.3	20.7	20.7	22.6	25.8	27.3	28.5	29.3	25.9

Source: Temperature - Bureau of Meteorology 2015, Lismore Airport (Station No. 058214), Rainfall – Bureau of Meteorology 2015, Union St Coraki (Station No. 058015)

Topography, drainage and waterways:

The site occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion, and includes the Lamington Volcanic Slopes, Grafton-Whiporie Basin and Clarence-Richmond Alluvial Plains Mitchell Landscapes.

The site is comprised of locally elevated land which rises above the adjacent floodplains and wetlands. Spring Hill is located in the western section of Lot 402, with a high point of approximately RL 47 m AHD. Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands. The topography of the surrounding area is predominantly low relief, flood prone, alluvial plains.

Plate 1. The existing stock watering dam on Lot 401 looking to the western boundary of Lot 401.

The Richmond River is located approximately 1.7 km to the east. Kennedys Swamp lies to the north and occupies the area north of the 5m contour line within Lot 408. Kennedys Swamp has an approximate catchment area of 200ha and is bounded by the Casino – Coraki Road to the east,

Newmans Road to the north and Spring Hill to the south and west. Surface runoff from the eastern slopes of Spring Hill flow east into the existing quarry and are then directed north through a small sediment retention basin into Kennedys Swamp.

Seelems Creek extends across Lot 403 DP 802985 and Lot 401 DP633427. The catchment area of Seelems Creek at this point is estimated to be in excess of 800ha and predominantly comprises agricultural land. Currently, surface runoff from the western slopes of Spring Hill flows into Seelems Creek. Surface water from the southern slopes of Spring Hill flows south by overland flow into a lower section of Seelems Creek. The New South Wales Water Quality and River Flow Objectives (OEH 2015) provides the water quality objectives for Uncontrolled Streams within the Richmond River Catchment. The physico-chemical indicators and numerical criteria (trigger values) for lowland rivers is shown below in Table 2.

Table 2 – Summary of Water Quality Objectives for Lowland Rivers*

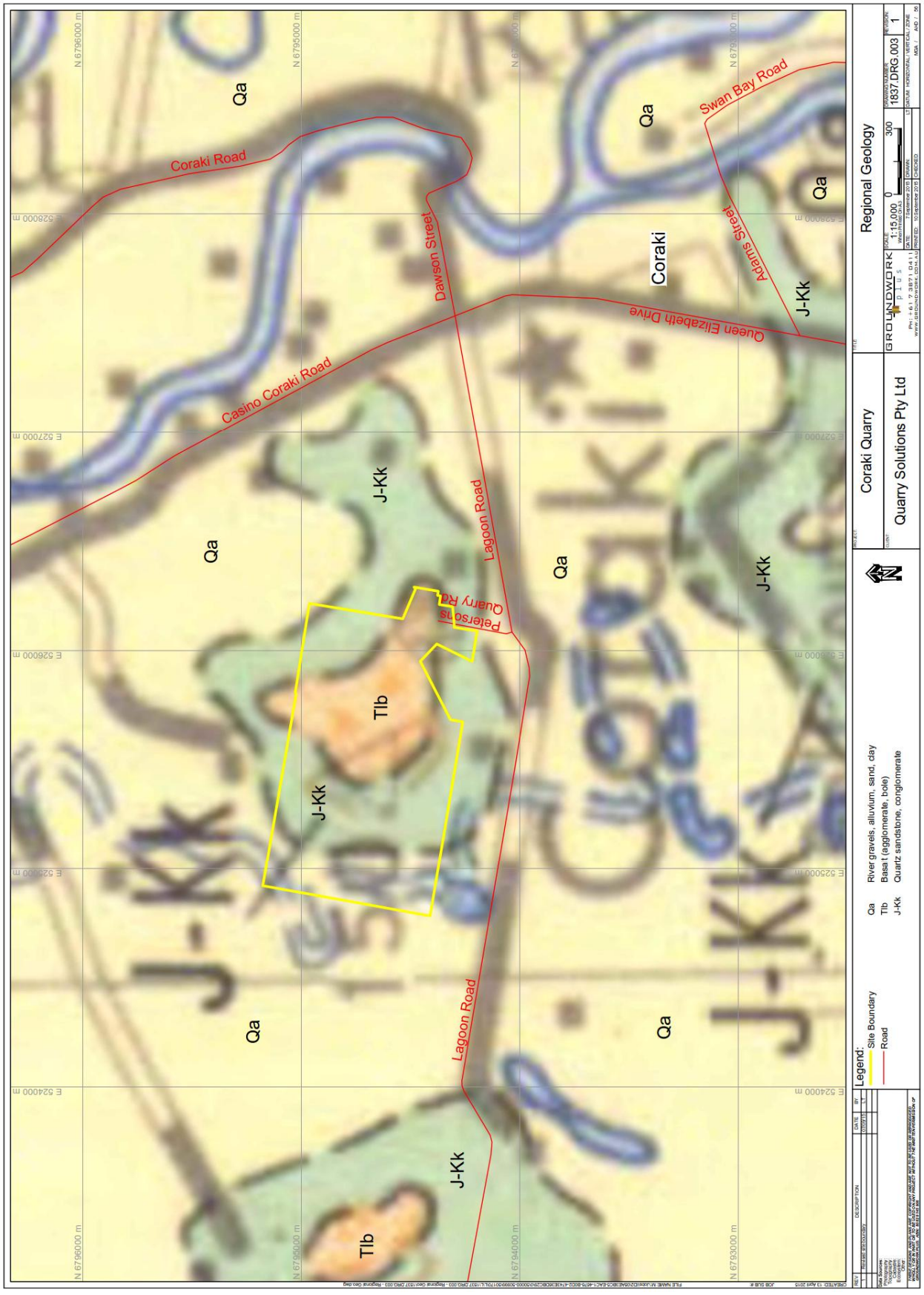
Total Nitrogen (N) (µg/L)	Total P (µg/L)	DO (%sat)		Turbidity (NTU)	pH		Conductivity (µs/cm)
		lower	upper		lower	upper	
350	25	85	110	6-50	6.5	8.5	125-2200

* Note: Physico-chemical indicator and numerical criteria has been based on the protection of aquatic systems water quality objective.

The land within the area traverses several different soil landscapes; including Coraki and McKee. These are residual landscapes, dominated by sites where deep soils have formed from in-situ weathering of parent materials. Landform elements include some summit surfaces, plateaux, terrace plain, peneplains and old ground surfaces (Morand 1994). The Coraki landscape is characterised by low, undulating rises on Kangaroo Creek Sandstone. The relief is 10-30 m and surface slopes are 2-10%. Elevation is generally <30 m and the vegetation has been extensively cleared (Morand 1994). The McKee landscape is characterised by very low to low undulating hills and rises on Lismore Basalts. Relief is 30-50 m with slopes up to 10%. Slopes are simple or waning and drainage depressions are common. This soil landscape has also been extensively cleared.

The broader study area includes the North Casino landscape which is characterised by drainage depressions forming swamps and intermittent swamps associated with the Richmond River Alluvial Plain. The Tweed Heads 1:250,000 Geological series sheet 56-3 indicates the underlying geology of Spring Hill comprises Lismore Basalts of the Tertiary period related to the Lamington Volcanics. A zone of Kangaroo Creek Sandstone of the Jurassic-cretaceous period surrounds the Spring Hill Lismore Basalts with alluvium sands and gravels from the Quaternary period (refer Figure 5 and Drawing No. 1837.DRG.003R1 Regional Geology).

Figure 5 Regional Geology



Geology and Groundwater Hydrology:

Seelems Creek is located in the western portion of the site. The catchment area of Seelems Creek at this point is estimated to be in excess of 800 ha and predominantly comprises agricultural land. Currently surface water runoff is directed into Seelems Creek. It is not known whether these surface water bodies are groundwater recharged, reliant purely on surface water, or a combination of both. Geotechnical investigations were undertaken in 2015. A soil and eluvium profile (overburden) overlies the entirety of area, amongst which sparse basaltic outcrops occur. The soil and eluvium profile generally thickens away from the main ridge line to the north and west. Over the main area of proposed quarrying activity the soil and eluvial profile is generally between 0.2m and 2m thick. The main basalt layer present within the eastern portion of Lot 401 on DP633427 was the focus of the investigations. This basalt is a black, fine grained, sparsely porphyritic, homogenous columnar jointed basalt interpreted to have high rock strength and durability. The basalt resource and flow varies from 12m to 20m in thickness.

Plate 2. View of the Basalt resource within an existing bench at the Petersons Quarry.

Groundwater was not intercepted in any of the bores drilled during the resource investigations despite extending below the depth of the resource to the underlying clay. There are no registered bores currently located within the site boundary. Groundwater in the local area is used for stock watering, irrigation, farm use and general (homestead) water supply. Based on local groundwater information sourced from the Bureau of Meteorology, there are a total of 34 groundwater bores within a 5 km radius search centred on the town of Coraki (approximately 2.5km south east of the Site). A representation of the closest bores to the site is provided below in Table 3.

Table 3 – Summary of Nearby Bores

Bore Reg. No.	Bore Status	Purpose	Lat. Long.	Direction from the site	Bore Depth (m)	Standing Water Levels
GW301592	Unknown	Stock and Domestic	-28.9667597 153.25700778	500m north	29.5m	nr
GW050643	Functional	Unknown	-28.96341102 153.25579271	850m north	6.1m	nr
GW045838	Unknown	Stock and Domestic	-28.97868869 153.27329254	300m east	6.1m	nr

Notes: nr = no records found

Erosion Risk: Erosion risk for the region based on monthly average rainfall depth is shown below in Table 4:

Table 4: Erosion Risk

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
H	H	H	H	H	M	M	M	M	M	H	H

Notes: E = Extreme, H = High, M = Medium, L = Low, VL = Very Low Sourced from Table 4.4.2, p. 4.12 of IECA.

Vegetation: The site area occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion (DoE 2015). The site includes the following; Mitchell Landscapes, (OEH 2015a), Lamington Volcanic Slopes, Grafton-Whiporie Basin, Clarence-Richmond Alluvial Plains.

The land consists of mainly open grassland with minor patchy scrub at lower elevations towards Seelems Creek to the west of the Site. Native vegetation recorded during the field survey was generally restricted to the western portions of Lot 401 on DP633427 and Lot 403 on DP802985, and along the boundary of Lots 402 and Lot 403 on DP802985.

Plate 3. View from the southern boundary of Lot 401 looking north along the proposed alignment of the internal access road to the western stockpile area, with the existing stock watering dam located to the west of the access road to be converted for surface water management.

The field survey identified four native vegetation types within or in close proximity to the study area, all of which are recognised as Endangered Ecological Communities (EECs), including, NR179: Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast, NR161: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast, NR217: Paperbark swamp forest of the coastal lowlands of the North Coast, NR150: Coastal freshwater meadows and forblands of lagoons and wetlands. Other native vegetation recorded onsite occurs as scattered paddock trees, planted amenity screens alongside access tracks, or as minor components within otherwise heavily disturbed and exotic-dominated patches of regrowth. Camphor Laurel and Lantana (Lantana camara) are dominant features of the latter.

Four specimens of a threatened species not returned by the database searches were recorded during the field survey, namely *Macadamia tetraphylla* (Rough-shelled Bush Nut). The specimens occur together within the centre of Lot 401 on DP633427, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the site.

Acid Sulphate Soil: The site is predominately mapped as containing Class 5 (lowest risk of containing acid sulphate soil) (refer Figure 6 and Drawing No. 1837.DRG.021R1 Acid Sulphate Soil Mapping).

Flooding: The site is not within the Flood Planning area in accordance with the NSW Planning Portal Mapping but is mapped as containing flood prone land in accordance with Richmond Valley Council's flood mapping. However, the operational areas of the project are located outside of the flood prone areas of the site (refer Figure 7 and Drawing No. 1837.DRG.011R1 1 in 100 year ARI design Flood).

Figure 6 Acid Sulfate Soil Mapping

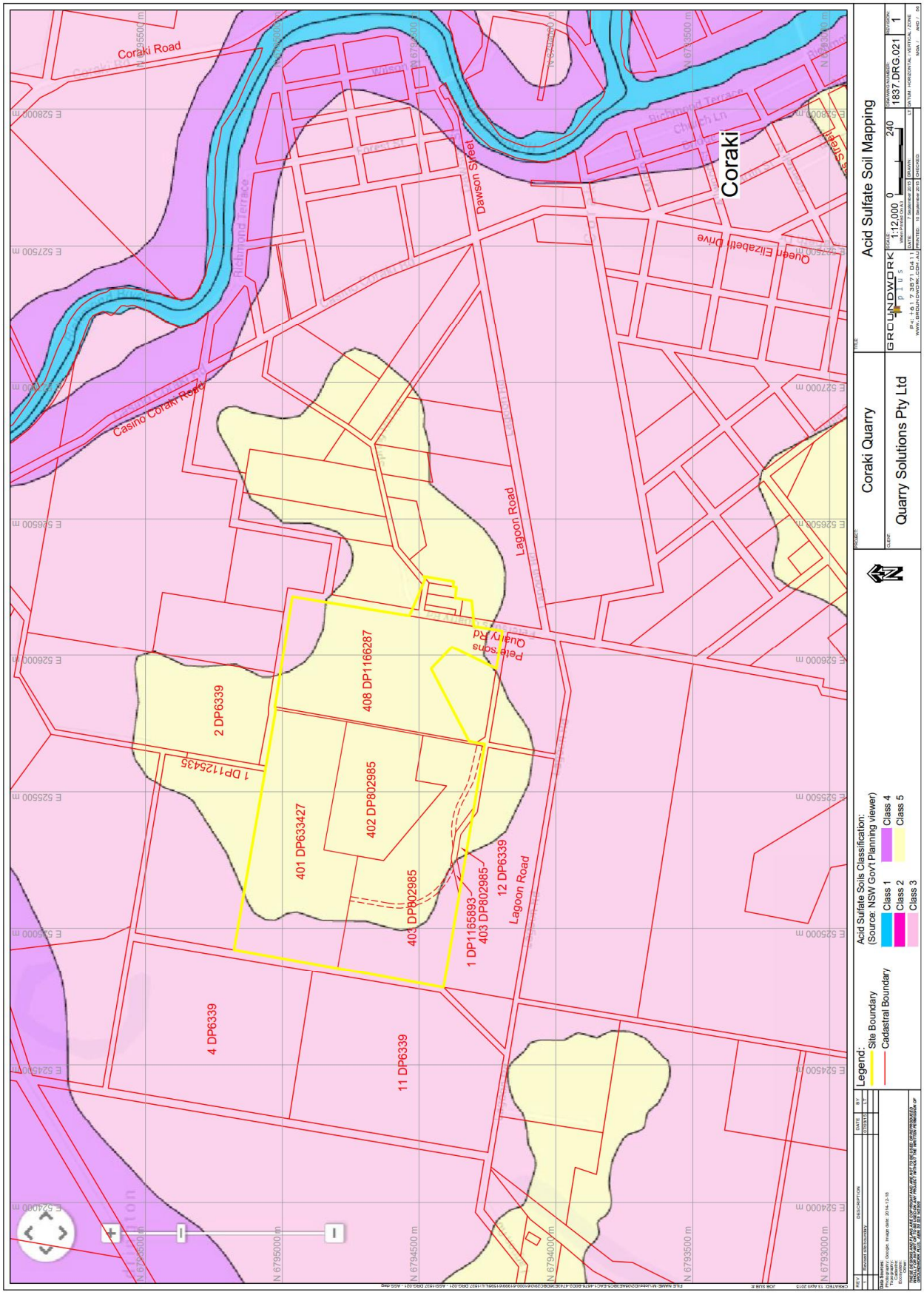
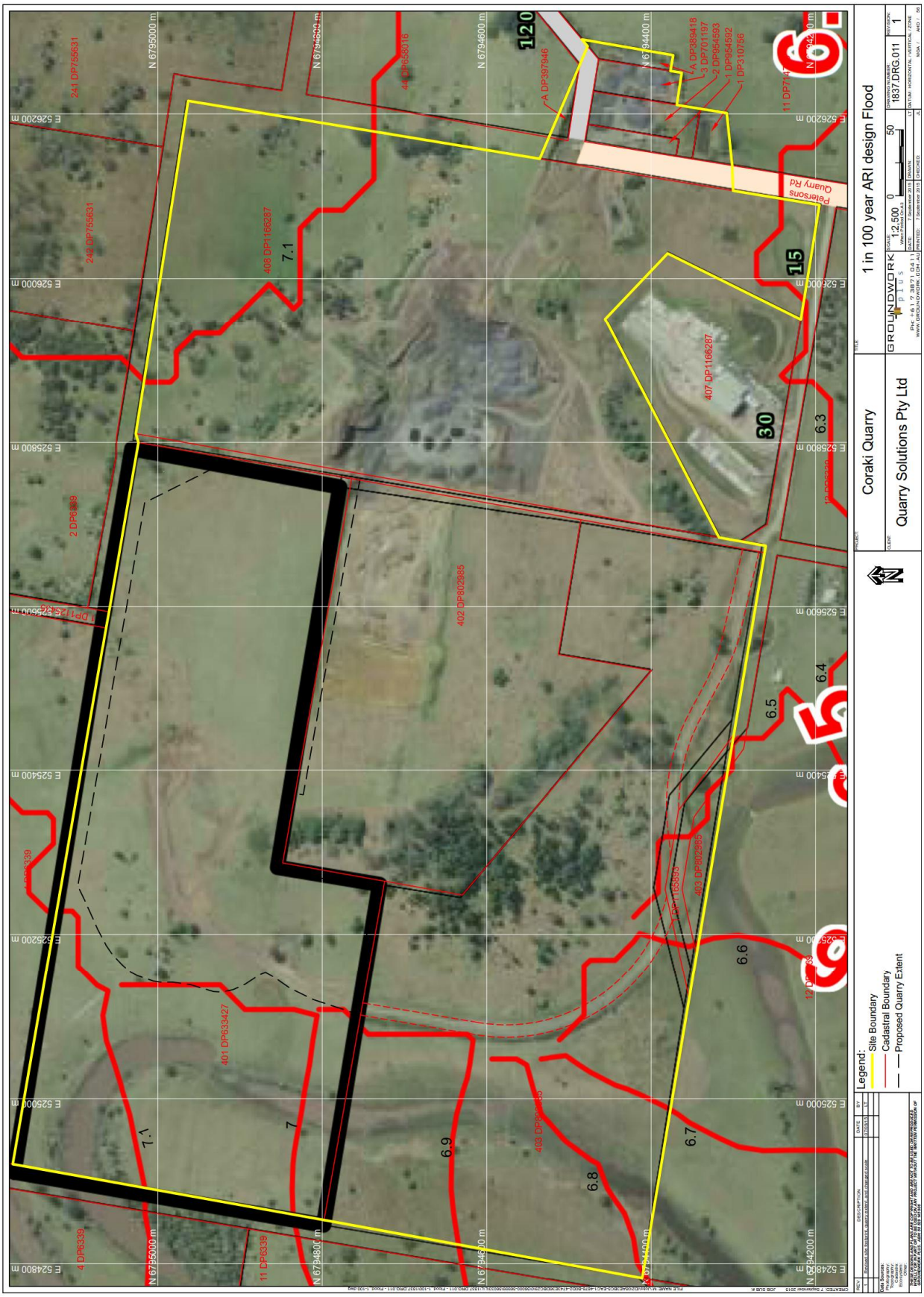


Figure 7 1 in 100 year ARI design Flood



Existing Land Use:	The site is currently utilised for cattle grazing and the existing Petersons Quarry.
Adjacent Land Use:	North – Rural area including cattle grazing. East – Rural area including cattle grazing and also semi-rural dwellings on Spring Hill Road. South – Industry (manufacture of pre-cast concrete panels) West – Rural area including cattle grazing.
Nearby Sensitive Receptors:	The nearest sensitive receptors to the extraction area are rural residences, approximately 595m to the south, 820m to the east, 335m to the north and 2.1km to the west (refer to Figure 4 and Drawing No. 1837.DRG.037 Nearby Sensitive Receptors).
Cultural Heritage:	The subject area was found to be highly disturbed by previous agricultural and quarrying land use. No Aboriginal object sites were recorded. Generally, the site has been found to be of low archaeological sensitivity and significance. However, one landform situated in close proximity to Seleems Creek is assessed to be of some greater archaeological potential and significance.
Air Quality:	The ambient air quality for the area is influenced primarily by agricultural activities, and the existing Petersons Quarry.
Noise:	Existing noise levels are considered to be representative of an existing quarry within a rural area and are likely to be attributed to operation of the existing Petersons Quarry, including blasting, extraction, crushing and screening, mobile equipment use and vehicle movements.
Visual Amenity:	It is likely that visual amenity from surrounding land may have line of sight to the stockpiling activities proposed to occur on the elevated levels of the site. However, as the design of the quarry is proposed to retain the receding rim of Spring Hill and extend the existing Petersons Quarry pit into Lot 401 it is anticipated that the extraction area and processing plant area will be well screened from surrounding land.

3.2 Description of the Proposal

3.2.1 Site layout and quarry design

A conceptual site layout is shown in Figure 2 and Drawing No. 1837.027 Conceptual Site Layout Plan. Extraction will primarily occur within Lot 401 as an extension of the existing Petersons Quarry pit. Stockpiling areas will be established on both Lot 401 and the Petersons Quarry land to achieve stockpile capacity for up to 1,000,000 tonnes of materials as requested by the delivery partner for the Pacific Highway upgrade project.

The existing site office, weighbridge and visitor car parking area of the Petersons Quarry will be utilised for the project. A site office and workshop will be established. These will be temporary demountable structures which would be removed at the completion of the project. It is anticipated that a number of shipping containers would be located within proximity to the workshop to provide secure storage for materials and equipment on an as needs basis. Fuel and chemical storage, including a self bunded above-ground fuel tank and oils for minor servicing onsite, would also be located in proximity to the site office and workshop. Any fuel and chemical storage facilities would be self bunded temporary demountable structures and removed from the site at the completion of the project. It is proposed to locate the site office, workshop and any fuel and chemical storage facilities within the existing site office, weighbridge and visitor car parking area of the Petersons Quarry as this area is topographically screened from the surrounding land.

The mobile processing plant for the project will be established within the existing Petersons Quarry pit to take advantage of the topographic screening available to that location which will assist in minimising potential risk of environmental nuisance from noise and dust emissions. The mobile processing plant for the project will also service the needs of the Petersons Quarry for the life of the project.

Plate 4. View of the pit of the existing Petersons Quarry looking west. The mobile processing plant will be located to the far left of view.

Given the time limited, project specific nature of the project the processing plant will consist of mobile crushing and screening plants rather than a permanent fixed plant. The existing stormwater detention basins of the Petersons Quarry will be augmented and sized to cater to the additional disturbance areas resulting from the project, in addition to a new stormwater detention basin on Lot 401. Water collected in the stormwater detention basins will be used to assist in dust management.

Figure 8 and Drawing No. 1837.032 Conceptual Quarry Development Plan Initial Extraction Stage, illustrates how the initial extraction area will be developed from the existing Petersons Quarry pit into Lot 401. The existing Petersons Quarry pit has a floor of approximately RL18m AHD. This will be continued into Lot 401. Internal benches will be developed to enable progressive extraction to occur from east to west within Lot 401. The internal northern face of the extraction area will be a single wall of approximately 20m in height to retain the receding rim of the hill, topographically screening the extraction operations both visually and acoustically from the surrounding land to the north, east and west. Stockpile areas will be established with earthworks required as necessary to establish pads or hardstand areas of suitable slope. Topsoil and overburden will be used to establish perimeter bunds where necessary to assist in visually screening the stockpile areas and also direct stormwater to the stormwater detention basins for treatment. A 25m wide buffer will be established around the *Macadamia tetraphylla* – Rough-shelled Bush Nut on Lot 401 to retain and protect those environmental values in situ.

Figure 9 and Drawing No. 1837.033 Conceptual Quarry Development Plan Final Extraction Stage, illustrates the full extraction of the resource on Lot 401 to a floor of RL18m AHD. Internal benches will adjoin the existing Petersons Quarry to facilitate continued efficient development of that resource for the Richmond Valley Council into the future. The internal northern and eastern face of the extraction area will be retained as a single wall of approximately 20m in height. The internal western face of the extraction area will be approximately 3m in height to transition to the western stockpile area on Lot 401. A ramp between the extraction area and the western stockpile area on Lot 401 will be retained in the final land form to accommodate continued connection for any potential redevelopment of the land.

Cross sections of the quarry design have been prepared to illustrate retention of the topographic features where possible to assist in visual and acoustic screening of the project (refer Figure 10 and Drawing No. 1837.035 Cross Sections A to E).

3.2.2 Production quantities

It is proposed to extract a maximum of 1,000,000 tonnes per annum dependant on project demand and timing. The expected operating life of the quarry is five (5) to seven (7) years subject to the duration of the upgrade works to the Pacific Highway. As the proposed development will involve extracting and processing more than 30,000 tonnes of extractive materials per year, it will require an EPL under the *Protection of the Environment Operations Act 1997* (POEO Act).

Figure 8 Conceptual quarry development plan initial extraction stage

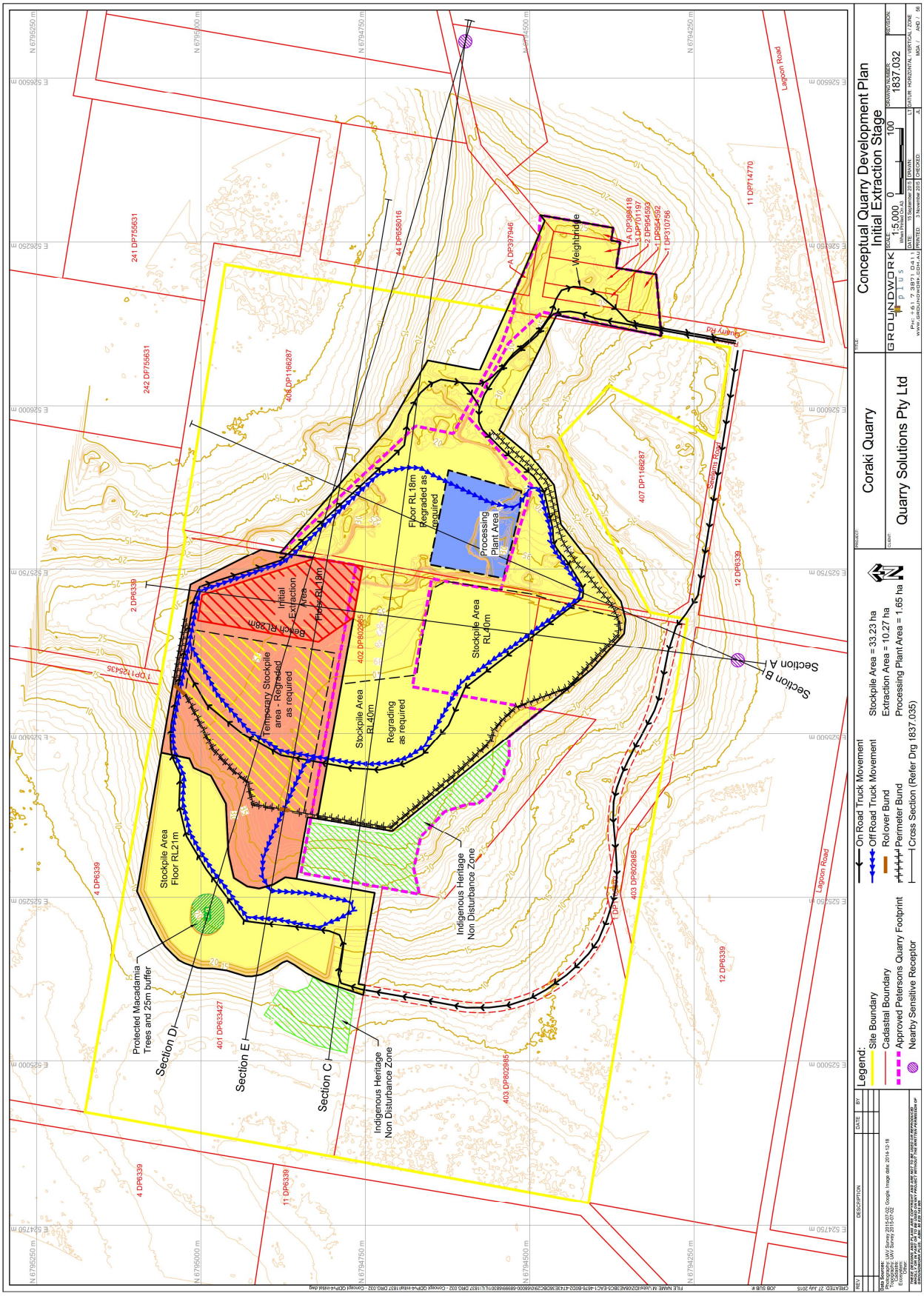


Figure 9 Conceptual quarry development plan final extraction stage

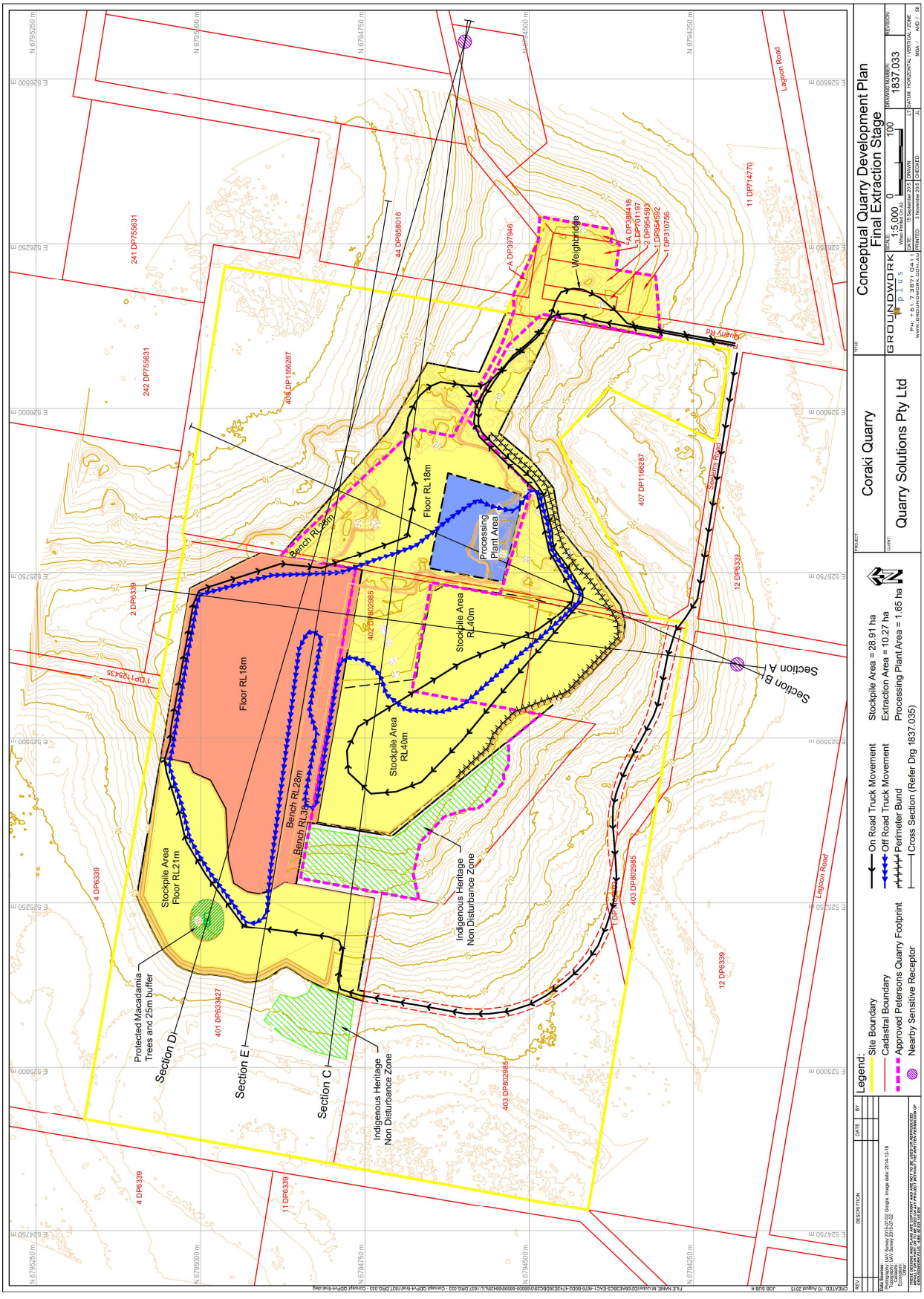
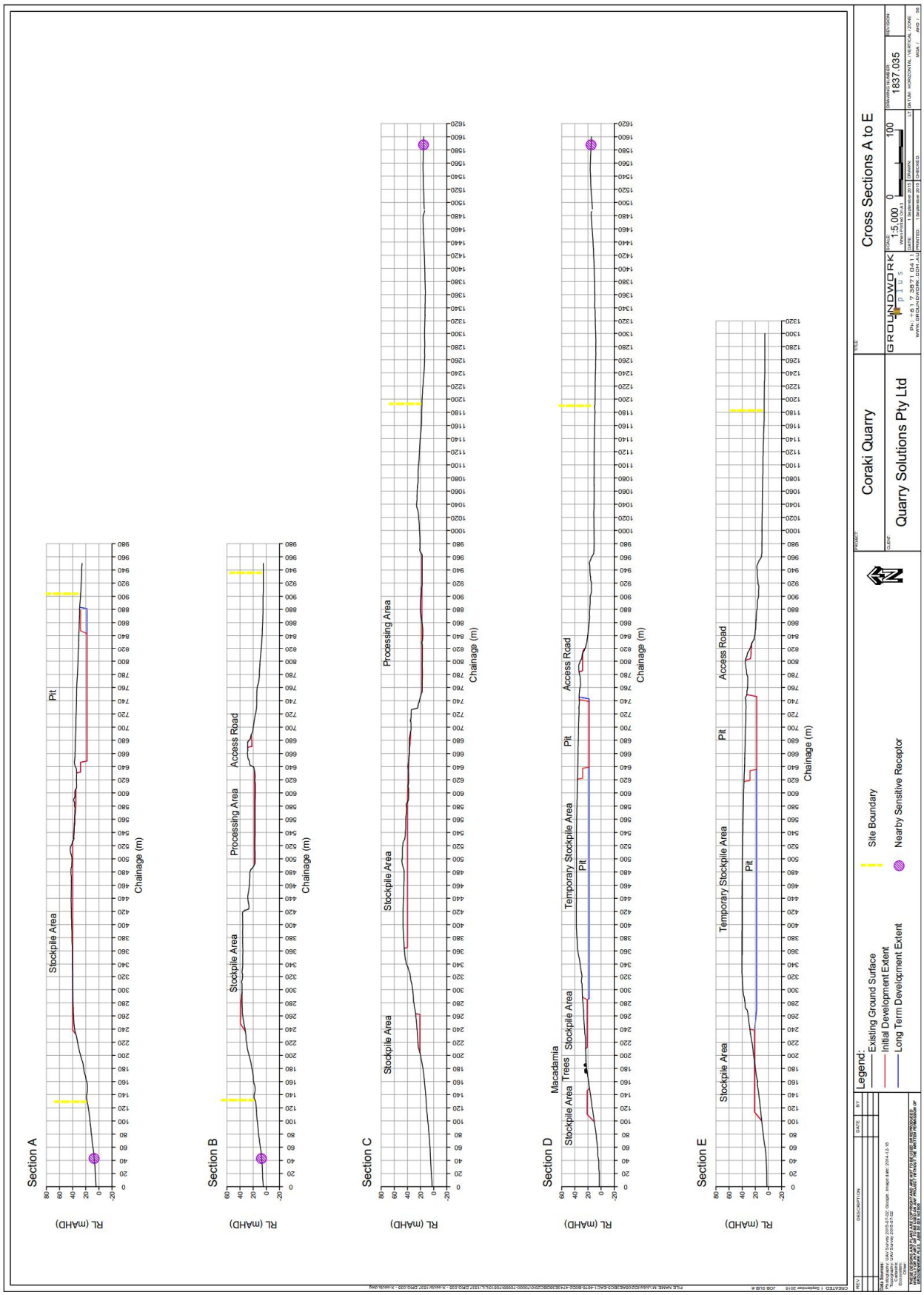


Figure 10 Cross sections A to E



3.2.3 Extraction and resource depth

The main basalt layer present within the eastern portion of Lot 401 was the focus of the resource investigations and where quarrying activities are proposed. The drilling delineated a large basalt resource between 13 and 42 metres AHD of approximately 3.3 million tonnes indicated resource. The basalt is a black, fine grained, sparsely porphyritic, homogenous columnar jointed basalt interpreted to have high rock strength and durability.

Petrographic examination of this material indicates that the material is predicted to be suitable for use in high quality roadbase, concrete aggregate and asphalt / sealing aggregate pending further source rock and material tests. The observations of the drill chip and core samples from investigations have generally supported the characteristics of this petrographic examination (high strength, low alteration) except in the weathered material which may be highly variable in its rock strength.

Based on the resource investigation the resource profile includes an overburden thickness of 0.2 to 2 metres and a basalt resource thickness of 12 to 20 metres. Based on the clearly delineated rock types encountered during drilling the basalt is revealed to overly an arkose sandstone at true depths. The interface of these two rock types is occupied by smectite clay and extremely weathered basalt facilitated by the hydraulic conductivity of the underlying sandstone.

Plate 5. Characteristic transition from pristine basalt (black) to extremely weathered and smectitic remnant basalt and clay (grey) to an arkose sandstone (orange-brown).

As part of the resource investigations, preliminary material tests were undertaken to assess the strength and durability of the materials intersected. The tests were undertaken on 10mm and 20mm aggregate samples from the Petersons Quarry, processed by a contractor employed by Council using a mobile crushing plant. The crushing plant circuit didn't include a vertical shaft impactor and subsequently material test results are likely to improve with the plant proposed to be used by Quarry Solutions for the project, ensuring deleterious material is liberated from the harder more competent resource.

Critical to the maximisation of the resource for the project will be an understanding of the road pavement design parameters and specifications and opportunities to work with the material quality prevalent at Coraki/Petersons. The results of the material tests are summarised below in Table 5. Based on the observations of the drill chips from the holes drilled into the basalt on Lot 401, it is considered a reasonable assumption that the strength and durability properties of the resource is consistent between the Petersons Quarry and the resource within Lot 401.

Table 5 – Source Material Test Results

Material Test	Test Method	Result
Dry Strength	RMS T215	253kN
Wet Strength	RMS T215	253kN
Wet/Dry Strength Variation	RMS T215	0%
Apparent Particle Density	AS1141.6.1	2.86t/m^3
Particle Density (S.S.D.)	AS1141.6.1	2.78t/m^3
Water Absorption (Coarse Aggregate)	AS1141.6.1	1.5%
Sodium Sulphate Soundness	AS1141.24	0.7%
Micro-Deval Abrasion	ASTM D7428-08	14.2
Los Angeles Value	AS1141.23	15%

Based on the above results an estimate of the resource volume is shown in Table 6 below. This estimate also assumes a 20m buffer to the northern property boundary of Lot 401.

Table 6 – Indicated Resource Estimate – Coraki Quarry Basalt

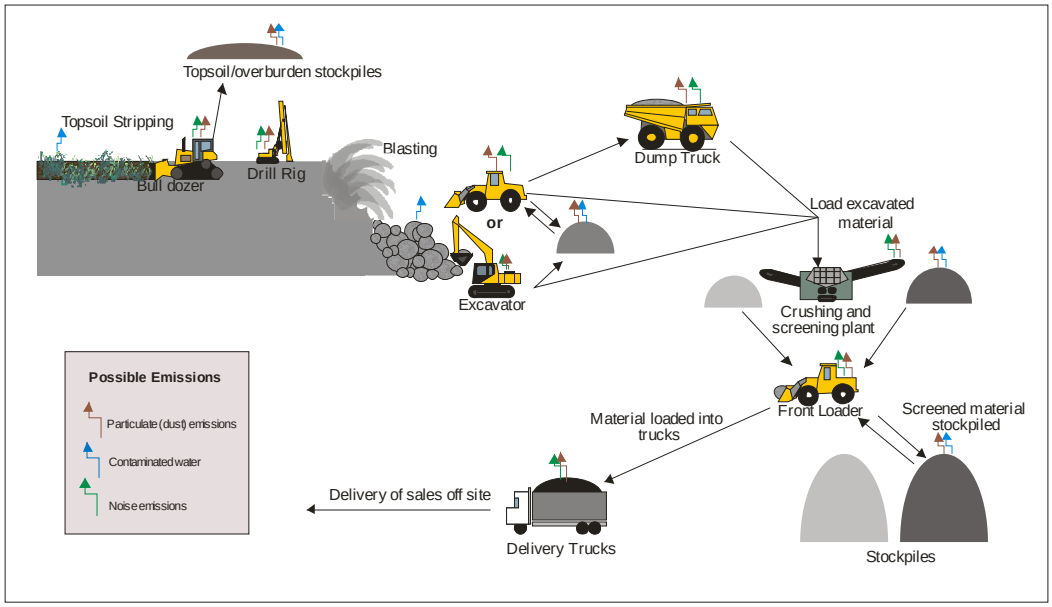
Proposed Coraki Quarry	Estimated m³ (*in situ*)	Specific Gravity (estimate)	Product Yield tonnes (*in situ*)
Overburden (including residual soils and extremely weathered material)	50,000	1.8 tonnes/m³	90,000
Transitional basalt material (Distinctly weathered basalt)	130,000	2.1 tonnes/m³	273,000
Unweathered Basalt (slightly weathered and fresh basalt)	1,050,000	2.78 tonnes/m³	2,919,000

*Rounded to nearest significant figure

3.2.4 Extraction method

The proposed quarry will use typical quarrying methodologies that involve clearing, topsoil and overburden stripping, drill and blast, extraction, load and haul (internal), processing and stockpiling, and sale, load and dispatch as shown in Diagram 1.

Diagram 1 – Conceptual Site Extraction Operations



Site operations comprise the following basic elements:

- clearing of vegetation and stripping of topsoil and overburden material using mechanical means (i.e. bulldozer or excavator) and stockpiling for incorporation into the site rehabilitation works where required, or use in constructing stormwater control structures (e.g. perimeter bunds)
- drilling and blasting the exposed underlying rock to a manageable size or extraction of less competent or fractured rock using mechanical equipment (e.g. hydraulic excavator or bulldozer with ripper attachment)
- loading won material from the extraction face by front end loader or excavator into off highway trucks for cartage to the crushing and screening plant.
- processing of the won material by the crushing and screening plant
- stockpiling of material in overhead storage bins/silos for either blending to produce roadbase using a pugmill or stockpiled on ground in the stockpile area/hardstand area by either front end load or off highway trucks.
- loading of products into road trucks using either a front end loader or directly from the pugmill for transport off site.

An EMP has been prepared to assist in the management and protection of surrounding environmental values and describes how the operator proposes to manage potential environmental impacts associated with the project (refer Attachment 2).

3.2.5 Water requirements

Water will be required where necessary for dust suppression during the construction and operational phases of the proposed quarry. Any water required for use on the site will be sourced from the sediment basin, rainwater tanks installed on the site buildings or imported from a licensed water contractor.

3.2.6 Equipment

Vehicles and equipment that will typically be required for the development and operation of the proposed quarry include (but are not limited to), mobile crushing, screening and blending plants, drill rigs, excavators, front end loaders, off highway trucks, water trucks, light vehicles and on-road delivery trucks.

Extractive industry operations require plant and equipment reliant on diesel fuel. The consumption of fuel will be minimised as the processing plant will be connected to the reticulated electricity network. Mobile equipment such as excavators, loaders and other minor plant will require diesel fuel. Accordingly, a specialist emissions assessment is not considered to be warranted in this instance.

3.2.7 Access and transport

Access to and from the site is via an existing track through Lot 403 on DP802985 and Lot 1 on DP1165893, via Seelems Road and Petersons Quarry Road which also services the existing Petersons Quarry. The existing access track from Seelems Road would be maintained where necessary. The anticipated haulage route to the Pacific Highway is via Petersons Quarry Road to Lagoon Road to Queen Elizabeth Drive to Coraki Woodburn Road to the Pacific Highway at Woodburn.

3.2.8 Hours of operation and project duration

The proposed hours of operation are 6am to 7pm Monday to Saturday, 9am to 3pm Monday to Friday for blasting, and no work on Sundays or public holidays. Operation of the quarry is planned to take place as soon as possible, subject to the appropriate approval being granted and timing of the Pacific Highway upgrade works. The expected operating life of the quarry is five (5) to seven (7) years subject to the duration of the upgrade works to the Pacific Highway.

3.2.9 Rehabilitation

Rehabilitation is an essential component of quarry planning and development. Good planning prior to the commencement of quarrying greatly assists in the management of environmental impacts and provides for efficient operations. The program for implementing rehabilitation works for quarries primarily depends on the rate at which terminal benches are reached. As the expected operating life of the quarry is only five (5) to seven (7) years (subject to the duration of the upgrade works to the Pacific Highway), it is anticipated that a majority of rehabilitation works will not be undertaken until the final stage of the project when terminal benches are reached. The site has been historically used for grazing. The final rehabilitated land form shall be compatible with the historical land use (e.g. grazing) in the short term, but facilitating long term redevelopment options, potentially for industrial uses subject to further strategic planning by Richmond Valley Council. Accordingly, the landform shall comprise of gently sloping free draining platforms with any remaining sediment basins converted into a water reservoir for stock watering purposes. Rehabilitation management measures are included in the EMP.

4. Statutory Requirements

4.1 Planning Context

The EP&A Act and associated regulations and environmental planning instruments provide the framework for assessing environmental impacts and determining planning approvals for developments in NSW.

The assessment also considers the requirements of the *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

4.2 Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulation 2000

Section 89C(2) of the EP&A Act states the following:

> *(2) A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.*

The project is classified as State Significant Development (SSD) under the *SEPP (State and Regional Development) 2011* (discussed in section 4.3 below) and as such is SSD for the purposes of the EP&A Act. The project will be assessed under Part 4 of the EP&A Act, with the Minister as the consent authority, taking into consideration the matters set out in Section 79C. As such, an EIS is required. This EIS has been prepared in line with Schedule 2 of the EP&A Regulation and addresses the obligations of the consent authority under Section 79C of the EP&A Act.

4.3 State Environmental Planning Policy (State and Regional Development) 2011

Section 8(1) of the *SEPP (State and Regional Development) 2011* designates certain development as SSD, as follows (our emphasis added):

> *(1) Development is declared to be State significant development for the purposes of the Act if:*
> *(a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and*
> *(b) the development is specified in Schedule 1 or 2.*

Schedule 1 of the *SEPP (State and Regional Development) 2011* includes extractive industries as being SSD if the following applies (our emphasis added):

> *(1) Development for the purpose of extractive industry that:*
> *(a) extracts more than 500,000 tonnes of extractive materials per year, or*
> *(b) extracts from a total resource (the subject of the development application) of more than 5 million tonnes, or*
> *(c) extracts from an environmentally sensitive area of State significance.*

As such, the project constitutes SSD and is assessed by the Minister as the consent authority under Part 4 of the EP&A Act.

4.4 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The relevant aims of the *SEPP (Mining, Petroleum Production and Extractive Industries) 2007* are:

- to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and

- to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources
- to promote the development of significant mineral resources
- to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources

Section 12 of this SEPP relates to the compatibility of the proposed extractive industry with other land uses. Pursuant to this section, before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

(a) consider:
  (i) the existing uses and approved uses of land in the vicinity of the development, and
  (ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and
  (iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and
(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and
(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).

The site is ideally situated for the project, being well separated from sensitive receivers and incorporating land associated with the existing Petersons Quarry. The surrounding area is rural in nature and sparsely populated. Apart from urban uses at Coraki, land uses in the vicinity of the site comprise low scale cattle grazing and/or large lot rural residential living.

Coraki is located approximately 2.5 kilometres to the south-east of the site. Given that the project is located on the northern and far side of the existing Petersons Quarry from Coraki, and the natural topography of the land between the project and Coraki provides for physical shielding of the project, it is unlikely that the project will lead to any significant disturbance or impacts to Coraki. However, it is acknowledged that transport of material to the Pacific Highway upgrade project will occur through Coraki.

In accordance with Part 3 of this SEPP, this EIS has also assessed the proposed development for the following:

Significance of resource	Section 3.2.3 and Attachment 9
Compatibility with existing land uses	Section 3.1 and 6.12
Impact on surface water and groundwater resources	Section 7.8, 7.9 and Attachment 8
Impact on threatened species and biodiversity	Section 7.4 and Attachment 5
Impact on air quality/greenhouse gas emissions	Section 7.5, 7.6 and Attachment 66.10
Resource recovery efficiency/re-use, recycling, waste	Section 7.14 and Attachment 2
Transport	Section 7.3 and Attachment 4
Rehabilitation	Section 7.11 and Attachment 2

4.5 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

The SEPP No. 33 – Hazardous and Offensive Development (SEPP 33) refers to and places obligations on potentially hazardous industry which is defined as any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk to human health, life or property or to the biophysical environment. This includes a hazardous industry and a hazardous storage establishment.

The project is designed to avoid significant risk to human health, life or property or to the biophysical environment and it is considered that the proposal does not constitute a potentially hazardous industry. However, a review has also considered the criteria outlined in Table 2 of the SEPP 33 guideline in relation to transportation of dangerous goods. It is anticipated that the project will require Class 5.1 (III) ammonium nitrate suspension as an explosive pre-cursor. Deliveries of the product may occur in single bulk delivery above the 2 tonne threshold. However, it should be noted that the same product is currently relied upon for the Petersons Quarry. Nevertheless, the project would therefore be considered a potentially hazardous development with respect to the transport of dangerous goods. This is assessed in Section 7.14.

4.6 State Environmental Planning Policy No. 44 – Koala Habitat Protection

SEPP No. 44 – Koala Habitat Protection (SEPP 44) encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free living populations will be maintained over their present range. This policy applies to each of the Local Government Areas (LGAs) listed in Schedule 1 of SEPP 44. The site is located within the Richmond Valley LGA. SEPP 44 lists Richmond River as an applicable LGA. The Richmond River Shire Council was amalgamated with the former Casino Council in 2000 to form the Richmond Valley Council. Therefore this SEPP is applicable to the site.

SEPP 44 restricts granting development consent on land identified as a core koala habitat without preparation of a plan of management. The Biodiversity Assessment Report advises that no evidence of Koala occurrence was found within the study area, and although it is possible this species may also occasionally utilise food trees occurring within the open paddock and fringing the wetlands, these areas are considered to be of less value to the species than the habitats occurring off-site. The proposed development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation recognised as native vegetation communities that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. Consequently, preparation of a koala plan of management is not required under SEPP 44.

4.7 State Environmental Planning Policy No. 55 – Remediation of Land

SEPP No. 55 – Remediation of Land (SEPP 55) aims to provide for a State-wide planning approach to the remediation of contaminated land and to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or the environment. Specifically, this policy aims to ensure that:

- Contamination and remediation are considered in zoning or rezoning proposals and development applications.
- Remediation works are permissible and only require consent where they have the potential for significant environmental impacts (Category 1). In all other cases no consent is required (Category 2).
- Local government authorities are notified before and after remediation takes place.
- Remediation is carried out to appropriate standards.

There are no existing known occurrences of contaminated land within the site and the nature of the project means that contamination is unlikely. Potentially contaminating activities associated with the project include the operation of a workshop and storage of diesel and oils. However, design and management measures are proposed to prevent potential contamination.

4.8 State Environmental Planning Policy North Coast Regional Environmental Plan

The *State Environmental Planning Policy North Coast Regional Environmental Plan* (REP) applies to the LGAs listed in Section 3, which includes the Richmond River LGA. The site is located within the Richmond Valley LGA. The Richmond River Shire Council was amalgamated with the former Casino Council to form the Richmond Valley Council in 2000. However, it is noted that Clause 1.9 (2) of the Richmond Valley Local Environmental Plan (LEP) 2012 directs that the REP does not apply to land administered by the LEP. Therefore the REP is not relevant.

4.9 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) sets the framework for environment protection during both the construction and operation of a development or scheduled activity.

Under Schedule 1 of the POEO Act, a licence would be required for:

- Land based extractive activities that involve extraction, processing or storage of more than 30,000 tonnes of extractive materials per year (Section 19).

Therefore, the project is a 'scheduled activity' and requires an EPL under Chapter 3 of the POEO Act. It is noted under Section 89K of the EP&A Act, an authorisation of the following kind cannot be refused if it is necessary for carrying out SSD that is authorised by a development consent under this Division and is to be substantially consistent with the consent:

(e) an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act).

4.10 Protection of the Environment Administration Act 1991

This Act established the Environment Protection Authority (now part of the Office of Environment and Heritage (OEH)). It enables OEH to provide administration for protection of the environment, carry out environmental audits and prepare reports on the state of the environment.

4.11 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) aims to conserve the State's natural and cultural heritage; foster public appreciation, understanding and enjoyment of the State's natural and cultural heritage; and manage any lands reserved for the purposes of conserving and fostering public appreciation and enjoyment of the State's natural and / or cultural heritage. The NPW Act governs the protection and care of native fauna and flora and aboriginal places and objects through NSW. Section 7.4 and Attachment 6 of this EIS assesses the impact of the proposal on native flora and fauna and the requirement for further assessment and referral. Section 7.2 and Attachment 3 of this EIS address the impact of the proposal on indigenous heritage.

4.12 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve and protect certain classes of threatened, endangered and vulnerable species, populations and ecological communities.

Section 5A of the EP&A Act lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then an Assessment of Significance would be required to determine the significance of the impact. If there is likelihood for a significant impact on threatened species, populations and their habitat or on ecological communities then a Species Impact Assessment is required.

Impacts on threatened species are discussed in Section 7.4 and Attachment 5.

4.13 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) regulates the clearing of native vegetation. Clearing is defined as, cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation including native grasses and herbage. Permission to clear native vegetation must be obtained for proposals under Part 4 of the EP&A Act. Impacts on native vegetation are discussed in Section 7.4 and Attachment 5 of this EIS.

4.14 Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines processes for approval of development which may impact items of heritage significance. A search of the State Heritage Inventory was undertaken, with no items identified within proximity to the site. The listed items located closest to the site, are located within Coraki approximate 2 kilometres south-east of the site.

4.15 Noxious Weeds Act 1993

The Noxious Weeds Act 1993 (NW Act) aims to prevent the establishment, reduce the risk of spread and minimise the extent of noxious weeds. The NW Act guides the management of declared noxious weeds within Local Government Areas (LGAs). A number of weeds species were recorded on site and are listed in appendix 6 of the Biodiversity Assessment Report (refer Attachment 5).

4.16 Fisheries Management Act 1994

The NSW *Fisheries Management Act 1994* (FM Act) provides for the protection of threatened fish and marine vegetation and is administered by the Department of Primary Industries (DPI). The FM Act aims to protect fishery resources and marine species, and conserve habitats and diversity.

The FM Act works in conjunction with the EP&A Act. If the following activities form part of a proposal, a permit from DPI under the FM Act is required:

- Aquaculture
- Dredging or reclamation
- Harm marine vegetation (mangrove, seagrass, seaweed)
- Obstruct free passage of fish.

The project has maintained buffers to mapped waterways and aquatic habitat areas and is located on a hill and adjacent to the existing Petersons Quarry. Specifically, no dredging is proposed. Surface water will be managed to achieve the relevant water quality objectives and release criteria to the set by the EPA, subject to the outcome of this EIS.

Accordingly, in our assessments and consideration of the project impacts, the following is not anticipated as part of the proposed development:

- Dredging
- Works within a waterway
- Impacts or damage to marine vegetation
- Placement of spoil in waterways
- Activities that block fish passage
- Impacts to fishing and aquaculture.

The proposed development is not subject to the provisions of the FM Act.

4.17 Water Management Act 2000

The Water Management Act 2000 (WM Act) protects rivers and foreshores and water resources in NSW by providing for the sustainable management of water resources.

The WM Act serves to protect ecosystems from excessive extraction of water. Water users are now generally required to obtain a licence (called a Water Access Licence or WAL) to extract surface water. Licences are also required to extract ground water from a bore.

The proposal will use dry extraction methods. Rainwater tanks will collect runoff from site buildings to provide a small amount of water for personal consumption. Water from sediment basins on the site will be used for dust suppression and to irrigate newly revegetated areas but do not require a water access licence as they will be required to achieve compliance with the conditions of the EPL issued for the site.

The WM Act includes provisions to control or permit works within 40 metres of the top of bank. The proposed development does not involve any works within 40 metres of the top of a bank, removing the requirement for a Controlled Activity Approval (refer section above, FM Act).

Geotechnical investigations were undertaken in 2015. Groundwater was not intercepted during the drilling despite extending below the depth of the resource to the underlying clay and sandstone layers. The existing Petersons Quarry pit has a floor at RL18m AHD and groundwater intrusion is not evident. The resource investigations confirmed that the underlying clay and sandstone layers were found approximately 1.9m below the existing floor of the Petersons Quarry. The project proposes to maintain a depth of RL18m AHD for extraction within Lot 401. Accordingly, no impact on groundwater is anticipated and a licence under the NSW Aquifer Interference Policy will not be required.

4.18 Roads Act 1993

The Roads Act 1993 (Roads Act) provides for the classification of roads and for the declaration of the Roads and Maritime Services (Roads and Maritime) and other public authorities as roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads. Richmond Valley Council is the relevant road authority, and Council's approval is required in accordance with Section 138 of the Roads Act 1993. Section 7.3 and Attachment 4 of this EIS addresses potential traffic impacts associated the proposed development.

4.19 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES). An assessment of MNES was undertaken as part of the Biodiversity Assessment Report (refer Attachment 5). A referral is not required as part of the project.

4.20 Richmond Valley Local Environmental Plan 2012

The proposed development is located in the Richmond Valley LGA. The relevant Local Environmental Plan (LEP) is the *Richmond Valley Local Environmental Plan 2012* (LEP). The site is located on land partly zoned RU1 Primary Production, and partly zoned E2 Environmental Conservation. The proposed development is solely located on land zoned RU1. Within the RU1 land zone, an extractive industry is permissible with consent. The proposed development is consistent with the objectives of the zone RU1, which are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To ensure that development does not unreasonable increase the demand for public services or public facilities.*

The following provisions of the LEP are relevant to a consideration of the application:

Clause 4.3 – Height of buildings
This clause provides direction on maximum building heights and siting of buildings to minimise potential visual impacts. The proposed development will require a demountable relocatable site office, which will be well below the maximum building height of 8.5 metres on the site. The site office will be located in proximity to the existing Petersons Quarry

weighbridge. This area of the site is well screened topographically and has traditionally been the location of the site office and amenities for the Petersons Quarry.

Clause 6.1 – Acid Sulfate Soils
The proposed development is located on land mapped as 'Class 5' on the Acid Sulfate Soils Map. Assessable development includes development on land mapped as 'Class 5', involving works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5m AHD and by which the water table is likely to be lowered below 1m AHD on adjacent Class 1, 2, 3 or 4 land. The proposed development is within 500 metres of land designated as 'Class 3' land, however, works will not occur below 5m AHD and the water table is not likely to be lowered as groundwater is not anticipated to be encountered. The resource investigations, encountered no groundwater in the extraction area. It is anticipated that any groundwater resides within the underlying clay and sandstone layer, and as it is proposed to retain a floor of basalt, no interaction with groundwater is anticipated. In addition, based on discussions with Council, no groundwater has been intercepted by operations at the adjacent Petersons Quarry. As such, the remainder of this clause is not applicable to the proposed development.

Clause 6.6 Terrestrial Biodiversity
This clause applies to land identified as 'biodiversity' on the Terrestrial Biodiversity Map. The Biodiversity Assessment Report (refer Attachment 5) considered the terrestrial biodiversity mapping and confirmed that the proposed development is located outside of the areas containing biodiversity value.

Clause 6.10 Wetlands
The Biodiversity Assessment Report (refer Attachment 5) considered the wetland values. The project will maintain appropriate buffers and surface water will be managed to achieve the relevant water quality objectives and release criteria to be set by the EPA (subject to the outcome of this application).

5. List of Approvals and Licences

In addition to the development consent from the Minister for Planning for SSD, it is anticipated that the following licences and approvals would be required to carry out the project:

- Environment Protection Licence pursuant to the *Protection of the Environment Operations Act 1997*
- Approval under Section 138 of the *Roads Act 1993* for works in a public road if works are required in relation to the sealing of Seelems Road.

6. Consultation

The integrity of the planning and assessment process is reliant on genuine and transparent stakeholder engagement. Quarry Solutions is committed to working with the community and being an active and responsible member of the local community. A project specific stakeholder engagement process has been undertaken as part of the environmental impact assessment process including engagement with relevant authorities, the Richmond Valley Council, local community members, adjoining land owners and residents, local businesses and the Bogal Local Aboriginal Land Council.

6.1 Local Community Engagement

6.1.1 Surrounding landowners

During the preparation of this EIS, Quarry Solutions has actively engaged with surrounding land owners, residents and local businesses through a coordinated effort of letters and telephone calls followed by face to face meetings held in early September 2015. Feedback received during those discussions were recorded by Quarry Solutions staff and was incorporated into the design of the development and proposed management measures. Formal responses from surrounding land owners, residents and local businesses were not received as part of this engagement process. The engagement program was supported by a Community Briefing Paper which communicated key aspects of the project. The primary issue raised by the engagement program included management of the additional truck movements through Coraki. This is addressed in more detail in Section 7.3 and Attachment 4.

6.1.2 Richmond Valley Council

Quarry Solutions proactively engaged with the Richmond Valley Council throughout the preparation of this EIS including a number face to face of meetings with Council officers, Councillors and the Mayor. Formal minutes of these meetings were not taken or issued. The primary issues raised during discussions included preservation of the Petersons Quarry resource for the needs of the local community and potential traffic impacts. Subsequently, (as discussed in Section 3.2) the project has been designed to extract material primarily from Lot 401 and establish working benches to facilitate the efficient development of the Petersons Quarry into the future. A range of management measures have also been identified to assist in minimising potential for traffic impacts, including for example a Driver's Code of Conduct and GPS monitoring of haulage trucks. It was also identified that the Section 94 Heavy Haulage Contributions Plans 2013 (RVC 2013) notes that an extractive industry use with the proposed annual extraction is required to pay $1.08/tonne for the pavement impact likely to be generated on Council's roads (refer Section 7.3 and Attachment 4).

6.2 Aboriginal Community Involvement

Consultation with the Aboriginal community has been undertaken in accordance with the guidelines as set out in the NSW OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010). This consultation process is discussed in detail in the Aboriginal Cultural Heritage Assessment Report (refer Attachment 3). No registrations of interest were made by any Aboriginal Parties other than the Bogal Local Aboriginal Land Council.

6.3 State Authorities

Consultation with relevant State Authorities has been undertaken during the preparation of the EIS to enable relevant issues to be identified and refinements made to the assessment process.

The Department of Planning & Environment (DP&E) were consulted with closely. On 24 April 2015 the request for SEARs for the project was submitted with the preliminary environmental assessment. On 22 May 2015 the DP&E provided the SEARs for the project. On 27 May 2015 the DP&E were consulted via email correspondence and telephone regarding inclusion of the Petersons Quarry land into the project, followed by submission of a revised conceptual site layout plan on 27 July 2015. Having considered the information provided the DP&E issued revised SEARs on 30 July 2015.

The New South Wales Environment Protection Authority (EPA) were contacted via email and telephone on 29 May 2015 to discuss the scope of the EIS and clarify a number of matters including, the intention to minimise diesel emissions by relying upon mains power for the processing plant and thereby not requiring a quantitative assessment of diesel emissions for the project. The EPA responded by email on 22 June 2015 confirming that a quantitative assessment of diesel emissions for the project and providing recommendation for the methodology of the noise and dust impact assessment. The advice of the EPA has been incorporated into the assessment of the potential noise and dust impacts generated by the project as discussed in Section 7.5 and 7.6 and Attachment 6.

The New South Wales Office of Environment and Heritage (OEH) was consulted by email and telephone on 12 June 2015 to clarify the scope of the EIS. OEH responded by letter dated 22 July 2015 that a person accredited in the NSW biobanking scheme would not need to prepare the Biodiversity Assessment Report subject to the protection of the 'Rough-shelled Bush Nut trees'. OEH also provided clarification via email dated 1 July 2015 that a flood impact assessment would not be required and the project could rely upon the Richmond Valley Council flood mapping to identify floor prone areas of the site. The recommendations of OEH have been incorporated into the assessment of biodiversity values in Section 7.4 and Attachment 5.

Dr Julie Dibden undertook direct consultation with OEH in accordance with OEH's Aboriginal cultural heritage consultation requirements for proponents 2010. Consultation included correspondence dated 4 May 2015 sent to, OEH, Bogal Local Aboriginal Land Council, Office of the Registrar Aboriginal Land Rights Act 1983, The National Native Title Tribunal, Native Title Services Corporation Limited and Richmond Valley Council. In addition an advertisement was placed in the local paper (Northern Star) on 6 May 2015. Following advice from OEH further correspondence dated 18 May 2015 was also sent to a list of known Aboriginal Parties for the Richmond Valley Local Government Area that OEH considered likely to have an interest in the project. The Office of the Registrar Aboriginal Land Rights Act 1983 responded (no date) indicating that it did not appear that there were registered Aboriginal owners for the project area. The Native Title Services Corporation Limited responded on 7 May 2015 indicating that they would provide the correspondence to any individuals, groups or organisations that it was aware of asserting traditional interest in the area. The Bogal Local Aboriginal Land Council responded on 11 May 2015 indicating that they required a survey of the area to be undertaken which subsequently occurred. The National Native Title Tribunal responded via email on 7 May 2015 indicating that Native Title has been extinguished for the area in question given the property is freehold. Further details of consultation are provided in Section 7.2 and Attachment 3.

DP&E, EPA and Roads & Maritime Services were consulted by email and telephone in June 2015 by Groundwork Plus, MWA Environment and MRCagney in relation to methodology of the traffic noise assessment and traffic impact assessment including location of monitoring and traffic survey points. The agencies confirmed verbally that potential off site transport impacts are to be assessed in accordance with the NSW Road Noise Policy and other relevant statutory documents. These matters have been assessed in detail in Section 7.3, Attachment 4, 7.5, 7.6 and Attachment 6.

The advice of the NSW Rural Fire Service was considered in relation to potential bushfire hazard and has been addressed in Section 7.14 and Attachment 2 and will be further managed in accordance with the existing Petersons Quarry Pollution Incident Response Management Plan (PIRMP) which will be revised in due course to incorporate the broader project area.

The New South Wales Department Primary Industries (DPI) and New South Wales Trade & Investment (DT&I) and North Coast Local Land Services were consulted by email and telephone on 28 May 2015 to discuss the scope of the EIS and clarify relevant matters including the DPI guideline Agriculture Issues for Extractive Industry (DPI 2012) and comments regarding fisheries protection. It was noted through subsequent email correspondence dated 28 and 29 May 2015 that whilst the site is mapped as containing regionally significant farmland, the site has a topsoil and overburden depth of less than 1m across the identified resource proposed to be extracted and therefore does not meet the criteria for regionally significant farmland. Through that discussion and email correspondence it was also confirmed that the incorrect version of the DT&I comments were attached to the DPI comments that were included in the original SEARs and in fact there were no items of concern regarding Fisheries. This resulted in a revised letter being issued by Kristian Holz, Director Policy, Legislation and Innovation, Department of Primary Industries. As such the Biodiversity Assessment Report was not required to include aquatic surveys. These matters have been addressed in Section 7.12 and 7.4 and Attachment 5.

The New South Wales Office of Water (OoW) was consulted by email and telephone on 28 May 2015 in relation to the project and the scope of the EIS in relation to surface water, water licencing and groundwater impacts. It was discussed that groundwater is unlikely to be intercepted considering the results of the resource assessment and decision to maintain the same depth of extraction as the Petersons Quarry (RL 18m AHD) which had not encountered groundwater. Proposed buffers of 40m to waterways and management measures for surface water were also discussed to clarify the anticipated water demand for the project. The OoW responded by email dated 28 May 2015 confirming that a water licence is unlikely to be required if the project is development consistent with this approved and that the EIS should outline the intended supply of water for the project and re-use of treated surface water for dust suppression. This information has been incorporated within Section 7.8 and Attachment 8.

6.4 Environmental Assessment Requirements

As the proposal is a designated development, SEARs were requested and were provided on 22 May 2015 and revised on 30 July 2015 (refer Attachment 1). Table 7 below provides a summary of assessment requirements from relevant agencies and a cross reference to where they are addressed within this EIS.

Table 7 – Summary of Environmental Assessment Requirements

Issue/ requirement	Addressed
Department of Planning and Environment	
A full description of the development, including: 1. Need 2. Resource description 3. Site layout and extraction plan 4. Extraction and processing activities 5. Infrastructure and facilities 6. Waste management strategy 7. Water management strategy 8. Rehabilitation strategy 9. Likely interactions with nearby quarries.	Refer the following: 1. Refer Section 2.2 2. Refer Section 3.1.3, 3.2.4 and 7.9 3. Refer Drawing No. 1837.027, 032, 033 and 035 4. Refer Section 3.2 5. Refer Section 3.2 6. Refer Section 7.14 7. Refer Section 7.8 8. Refer Section 7.11 9. Refer Section 3 and Drawing No. 1837.027, 032, 033 and 035
A list of relevant approvals.	Refer Section 5
An assessment of likely environmental impacts, including: · Existing environment · Likely impacts · Implementation measures to mitigate or manage likely impacts · Monitoring and reporting measures	Refer Section 7
A consolidated summary of proposed environmental management and monitoring measures	Refer Section 8
Consideration of relevant environmental planning instruments	Refer Section 4
Reasons why the development should be approved, with regard to ESD	Refer Section 7.16
The EIS must address the following specific matters:	
· Land resources	Refer Section 7.12
· Traffic and transport	Refer Section 7.3
· Blasting and vibration	Refer Section 7.7
· Air quality	Refer Section 7.6
· Noise	Refer Section 7.5
· Surface and groundwater	Refer Section 7.8 and 7.9
· Biodiversity	Refer Section 7.4
· Aboriginal and historical heritage	Refer Section 7.2
· Visual	Refer Section 7.10
· Hazards	Refer Section 7.14
· Social and economic	Refer Section 7.13
· Rehabilitation	Refer Section 7.11
· Consultation	Refer Section 6.0

6.5 Public Exhibition and Notification

Section 89(F) of the EP&A Act outlines public participation procedures for SSD, which requires, as soon as practicable after a development application is made for consent to carry out SSD, the Secretary must:

1. *place the application and any accompanying information on public exhibition for a period (of not less than 30 days) prescribed by the regulations (the submission period) commencing on the day after which notice of the application is first published as referred to in paragraph (b), and*
2. *cause notice of the application to be given and published in accordance with the regulations.*

7. Environmental Assessment

7.1 Potential Environmental Impacts

The Preliminary Environmental Assessment for the project identified aspects of the project which could potentially cause environmental impacts and warranted further detailed assessment as part of this EIS. Those aspects are summarised below in Table 8.

Table 8 – Summary of Potential Environmental Impacts

Issue	Potential Impact	Specialist Assessment Required
Archaeology and historic heritage	New areas of disturbance area proposed. The NSW Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS), identifies one record near the site. Accordingly, an Aboriginal Cultural Heritage Assessment Report (refer Attachment 3) has been prepared. That assessment also addresses non-aboriginal heritage matters.	Yes, refer to Section 7.2
Traffic	Extractive industry operations require haulage of extracted material via the surrounding road network which if not adequately managed may cause physical damage to roads. Accordingly, a Traffic Impact and Pavement Assessment Report (refer Attachment 4) has been prepared	Yes, refer to Section 7.3
Biodiversity	Extractive industry operations often require clearing of vegetation. These activities if not adequately controlled, may cause impacts to areas of biodiversity value. The project has been designed to avoid impacts to areas considered to hold biodiversity value and is primarily located within areas of the site devoid of native vegetation. However, extractive industry operations also involve activities which if not adequately managed may result in impacts to native vegetation from introduction or spread of noxious and environmental weeds. Accordingly, a Biodiversity Assessment Report (refer Attachment 5) has been prepared.	Yes, refer to Section 7.4
Noise & Air Quality	Extractive industry operations have the potential to generate noise and dust emissions that, if inadequately controlled, may cause nuisance to nearby sensitive receptors. Accordingly, a Noise and Dust Assessment (refer Attachment 6) has been prepared.	Yes, refer to Section 7.5 and 7.6
Vibration	Extractive industry operations have the potential to generate vibration impacts which if inadequately managed may impact nearby sensitive receptors. Accordingly a Blast Parameters Evaluation (refer Attachment 7) has been prepared.	Yes, refer to Section 7.7
Surface water	Extractive industry operations have the potential to generate sediment loads which if inadequately managed may impact on surface water quality. Accordingly a Surface Water Management Assessment (refer Attachment 8) has been prepared.	Yes, refer to Section 7.8
Groundwater	The Petersons Quarry has been in operation since 1916. The existing floor of the Petersons Quarry is at RL 18m AHD. No groundwater intrusion is evident within Petersons Quarry. Resource investigations did not encounter groundwater (refer Attachment 9). The proposed Coraki Quarry would establish a pit floor at RL 18m AHD consistent with Petersons Quarry. Accordingly, it is understood that the local groundwater is held within the underlying sandstone and clay and retention of the pit floor will provide suitable separation.	No, refer to Section 7.9
Visual amenity	The project will utilise the existing Petersons Quarry which is topographically screened from surrounding residents to facilitate the initial extraction area for the Coraki Quarry. Stockpiling will occur on the crest of the hill. Earthen bunds are proposed to provide visual and acoustic screening and to assist in stormwater management. Accordingly, the project has been designed to minimise potential visual amenity impacts.	No, refer to Section 7.10
Rehabilitation	Extractive industry operations include activities which disturb the existing soil structure by removing the extractive resource. Rehabilitation of disturbed areas to a safe, stable, non-polluting state is required to return the land to a suitable state for re-commencement of the historic land use (cattle grazing) or new land use (subject to relevant approvals). Accordingly, rehabilitation of the site at the conclusion of the project is addressed in the EMP.	No, refer Section 7.11
Land use, land forms and agricultural suitability	Extractive industry operations include activities which disturb the existing soil structure by removing the extractive resource. Extractive industry operations also involve activities which have the potential to generate dust which if not adequately managed may impact on agricultural activities. The site is located in proximity to rural and agricultural activities. However, the site is not considered to be good quality agricultural land as it has a topsoil and overburden depth of less than 1m. The project will be managed in accordance with the measures outlined in the EMP which will minimise the potential for dust impacts to nearby sensitive receptors.	No, refer to Section 7.12
Socio-economic	The potential socio-economic impacts of the project have been assessed as part of this EIS.	No, refer to Section 7.13
Hazards	The project does not constitute a potentially hazardous industry and hard rock extractive industry operations generate limited amounts of waste. Any fuels and chemicals stored on-site will be stored in accordance with the relevant standards and licence requirements. Disposal of waste will be managed by a licenced waste contractor.	No, refer to Section 7.14
Cumulative impacts	The cumulative impacts of the project have been addressed as part of the specialist assessment supporting the EIS.	No, refer to Section 7.15
Ecologically Sustainable Development (ESD)	The project is to be assessed in relation to the principles of ESD.	No, refer to Section 7.16

7.2 Archaeology and Historic Heritage

Key findings

A process of Aboriginal community consultation and assessment (refer Attachment 3) has been undertaken to identify and record any Aboriginal cultural areas, objects or places and to assess the archaeological potential of the proposal area, and to formulate management recommendations based on the results of community consultation, background research, field survey and significance assessment. The site was found to be highly disturbed by previous agricultural and quarrying land use.

No Aboriginal object sites were recorded. Generally, the site has been found to be of low archaeological sensitivity and significance.

The entire area in which impacts would occur has undergone relatively high levels of prior disturbance associated with land clearance/agriculture and previous quarrying. This previous land use is assessed to have caused reasonably high levels of impact to almost all ground surfaces and hence, to any Aboriginal objects which may once have been present in those areas.

The impacts associated with almost 100 years of quarrying cover an area measuring approximately 17.5 hectares. These impacts include deep quarrying and more shallow disturbances associated within stockpile clearing. All areas however, possess negligible areas of original ground surface. Accordingly, the area encompassed by the existing quarrying works has no potential to host Aboriginal cultural materials.

Impacts in the remainder of the subject area vary. All areas have been cleared of original native vegetation and have been used for agriculture. Ground surfaces are now covered with introduced pasture species including couch and kikuyu. Remnants of farm fences and infrastructure remain. Generally the ground surfaces are uneven indicating prior disturbance. Minor land disturbance has occurred at the western edge of the basalt in Lot 401. Elsewhere, farm dams, water diversion channels and a well formed access road into Lot 401, have caused localised impacts.

There is one known site located on the site of the existing Petersons Quarry which has information restrictions and its nature is not discussed further here. It is, however located within a previously defined Non Disturbance Zone which will be maintained by the project. One additional land form was identified situated in close proximity to Seleems Creek and assessed to be of some greater archaeological potential and significance. This project will respect that land form by including an additional Non Disturbance Zone (refer Figure 2 and Drawing No. 1837.027 Conceptual Site Layout Plan).

The proposed development would entail the removal and disturbance of potential artefact bearing deposit and, accordingly, has the potential to cause fundamental impacts to any Aboriginal areas, places or objects. The proposed works entail ground disturbance and, accordingly, have the potential to cause impacts to any Aboriginal areas, places or objects which may be present within the zones of direct impact. However, no Aboriginal object sites have been recorded in the proposed extraction and stockpiling areas. Accordingly, no harm to Aboriginal objects is proposed. It is noted that the previously identified Non Disturbance Zone in which AHIMS 04-4-0142 is located will be maintained and would not be disturbed as a result of the project.

No Aboriginal objects or cultural values are known to occur in the area of the proposed impacts. Consideration of ecologically sustainable development and cumulative impacts in regard to Aboriginal heritage are not necessary. Avoidance or the mitigation of harm has not been considered as an option in relation to the proposed activities. It is considered that the significance of the Aboriginal objects is not sufficient to warrant the implementation of impact avoidance strategies. No known items of historic heritage significance occur within the proximity of the site and therefore the project is not expected to impact either directly or indirectly on any listed heritage item.

Recommended management strategies include the establishment of the additional Non Disturbance Zone, (which has been incorporated into the design of the project) and the preparation of an Aboriginal Heritage Management Plan (AHMP) by the project archaeologist, in consultation with the NSW OEH and Registered Aboriginal Parties. The management plan would set out procedures relating to the management and mitigation of development impacts, a

protocol for the management of unexpected archaeological finds and the conservation of areas outside the extraction footprint, as required.

7.2.1 Introduction

The content and format of the report is set out in accordance with the NSW OEH (2011) Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW document. The report aims to document:

- The Aboriginal objects and declared Aboriginal places (as relevant) located within the area of the proposed activity;
- The cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places that exist across the whole area that will be affected by the proposed activity, and the significance of these values for the Aboriginal people who have a cultural association with the land, as relevant;
- How the requirements for consultation with Aboriginal people have been met (as specified in clause 80C of the NPW Regulation);
- The views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if relevant);
- The actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified;
- Any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places (if relevant); and
- Any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or, if this is not possible, to manage (minimise) harm (if relevant).

The assessment has been managed and undertaken by Julie Dibden (Australian National University: BA with Honours; PhD), NSW Archaeology Pty Ltd and the following section of this EIS is based on her expert advice contained within Attachment 3.

7.2.2 Description of the area

Aboriginal people have occupied NSW for more than 42,000 years. Evidence and cultural meanings relating to occupation are present throughout the landscape. A consideration of landscape is particularly valuable in archaeological modelling for the purposes of characterising and predicting the nature of Aboriginal occupation across the land. In Aboriginal society, landscape could be both the embodiment of Ancestral Beings and the basis of a social geography and economic and technological endeavour. The various features and elements of the landscape are/were physical places that are known and understood within the context of social and cultural practice.

Given that the natural resources that Aboriginal people harvested and utilised were not evenly distributed across landscapes, Aboriginal occupation and the archaeological manifestations of that occupation will not be uniform across space. Therefore, the examination of environmental context is valuable for predicting the type and nature of archaeological sites which might be expected to occur. Factors that typically inform the archaeological potential of landscape include the presence or absence of water, animal and plant foods, stone and other resources, the nature of the terrain and the cultural meanings associated with a place.

Additionally, geomorphological and humanly activated processes need to be defined as these will influence the degree to which material evidence may be visible and/or conserved. Land which is heavily grassed and geomorphologically stable will prevent the detection of archaeological material, while places which have suffered disturbance may no longer retain artefacts or stratified deposits. A consideration of such factors is necessary in assessing site significance and formulating mitigation and management recommendations. The following information describes the landscape context of the subject area.

The subject area is on the Wardell 1:25,000 topographic map. For mapping purposes it is in Zone 56. The project would occur in Lot 401 DP633427, Lot 402 DP802985, Lot 403 DP802985, Lot 408 DP1166287, Lot 1 DP954592, Lot

2 DP954593, Lot 3 DP701197, Lot A DP389418, Lot 1 DP310756, Lot A DP397946 in the Parish of West Coraki, County of Richmond.

The subject area occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion, and includes the Lamington Volcanic Slopes, Grafton-Whiporie Basin and Clarence-Richmond Alluvial Plains Mitchell Landscapes (BAAM Pty Ltd 2015).

The subject area is comprised of locally elevated land which rises above the adjacent floodplains and wetlands. Spring Hill is located in the western section of Lot 402, with a high point of approximately RL 47 m AHD. Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands. The topography of the surrounding area is predominantly low relief, flood prone, alluvial plains (Figure 2).

The Richmond River is located approximately 1.7 km to the east. Kennedys Swamp lies to the north and occupies the area north of the 5 m contour line within Lot 408. Kennedys Swamp has an approximate catchment area of 200 ha and is bounded by the Casino – Coraki Road to the east, Newmans Road to the north and Spring Hill to the south and west. Surface runoff from the eastern slopes of Spring Hill flow east into the existing quarry and are then directed north through a small sediment retention basin into Kennedys Swamp.

Seelems Creek extends across Lot 403 DP 802985 and Lot 401 DP633427. The catchment area of Seelems Creek at this point is estimated to be in excess of 800 ha and predominantly comprises agricultural land. Currently, surface runoff from the western slopes of Spring Hill flows into Seelems Creek. Surface water from the southern slopes of Spring Hill flows south by overland flow into a lower section of Seelems Creek.

The land within the study area traverses several different soil landscapes; including Coraki and McKee. These are residual landscapes, dominated by sites where deep soils have formed from in-situ weathering of parent materials. Landform elements include some summit surfaces, plateaux, terrace plain, peneplains and old ground surfaces (Morand 1994).

The Coraki landscape is characterised by low, undulating rises on Kangaroo Creek Sandstone. The relief is 10-30 m and surface slopes are 2-10%. Elevation is generally <30 m and the vegetation has been extensively cleared (Morand 1994). The McKee landscape is characterised by very low to low undulating hills and rises on Lismore Basalts. Relief is 30-50 m with slopes up to 10%. Slopes are simple or waning and drainage depressions are common. This soil landscape has also been extensively cleared.

The broader study area includes the North Casino landscape which is characterised by drainage depressions forming swamps and intermittent swamps associated with the Richmond River Alluvial Plain. The Tweed Heads 1:250,000 Geological series sheet 56-3 indicates the underlying geology of Spring Hill comprises Lismore Basalts of the Tertiary period related to the Lamington Volcanics. A zone of Kangaroo Creek Sandstone of the Jurassic-cretaceous period surrounds the Spring Hill Lismore Basalts with alluvium sands and gravels from the Quaternary period. During the field inspection, pebbles derived from conglomerate associated with the sandstone were observed in isolated exposures on the simple slope.

Excavations undertaken at the existing quarry show shallow topsoils, typically only 200 mm thick, overlying approximately 1.8 m of 'overburden' material comprising weathered basalt and soil. Pockets of structured, plastic clays are located throughout the proposed quarry. Basalt, the material extracted from the existing quarry, is located beneath this overburden area.

The unquarried area of Lot 402 currently comprises dense grassland and patches of weeds which have colonised following the removal of cattle. Lot 401 DP633427 is still grazed and grass and weed cover is consistent. Lower areas within Lot 403, to the west and south-west of the proposed quarry include disturbed wetlands associated with Seelems Creek. A mixture of dry rainforest species were planted in 2008 along both sides of the access road (right of carriageway) through Lot 403 to Lot 401 DP 633427 (clearly visible in Figure 2).

Before European colonisation, the native vegetation would have comprised largely dense gallery rainforest stands which are reported to have covered the Richmond River floodplains (Collins 2005). It is noted here that Belshaw (1978)

has argued that areas of rainforest may have been uninhabited or inhabited irregularly. Much of this vegetation has been cleared for cattle grazing and agriculture, particularly for the sugar cane plantations. BAAM Pty Ltd (2015) identified four native vegetation types within or in close proximity to the subject area:

- Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast – a component of the Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions.
- Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast – a component of the Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion.
- Paperbark swamp forest of the coastal lowlands of the North Coast – a component of the Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.
- Coastal freshwater meadows and forb lands of lagoons and wetlands – a component of the Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.

These four communities occur outside the development footprint. In areas where impacts would occur, the shrubby vegetation is dominated by Camphor Laurel (*Cinnamomum camphora*) and Lantana (*Lantana camara*).

7.2.3 Material evidence of peoples living on the land

A search of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) was conducted on 29th April 2015 (AHIMS client service ID: 170901). The search area measures 240 square kilometres, with a buffer of 50 meters, and is encompassed by the following co-ordinates at Datum GDA, Zone 56 - Eastings: 519000 - 534000, Northings: 6786000 - 6802000. A total of 27 Aboriginal sites are located in the AHIMS search area, some of which are discussed below (Table 1; Figure 3). Note. A number of AHIMS sites including the two discussed below, have information restrictions.

Searches have been conducted of the NSW State Heritage Inventory and the Australian Heritage database. No Aboriginal heritage sites are listed on these as being in the proposed activity area. The AHIMS register only includes sites which have been reported to NSW OEH. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal objects situated within the local area or indeed within the study area itself.

Two sites on the AHIMS register are located in or close to the subject area and these are discussed below.

- AHIMS 04-4-142 Spring Hill Coraki - located on the western end of Lot 402 DP802985.
- AHIMS 04-4-0121 Twin Pines Birth Place - located south of the property and subject area.

However, in general terms there has been very little archaeology conducted in the immediate local area.

7.2.4 Predictive model of aboriginal site distribution

The assessment adopted a predictive model to assist in the consideration of the type of Aboriginal objects know to occur in the region and the potential for their presence within the subject area to occur.

Stone Artefacts
Stones artefacts are located either on the surface and/or in subsurface contexts. The detection of artefacts depends on ground surface factors and whether or not the potential archaeological bearing soil profile is visible. Prior ground disturbance, vegetation cover and sediment/gravel deposition can act to obscure artefact presence. The raw materials used for artefact manufacture will commonly be silcrete, chert, quartzite, quartz and volcanics. Within the local area, stone artefacts will be widely distributed across the landscape in a virtual continuum, but with significant variations in density in relation to different environmental factors. Artefact density and site complexity will be greater near reliable water and the confluence of resource zones.

Given the environmental context, it is assessed that in the subject area stone artefacts will be present in variable densities ranging from negligible/low to low/moderate density. Higher artefact density is predicted to be present on reasonably flat ground close to Seelems Creek. Elsewhere, artefact density is predicted to be very low.

Grinding Grooves
Grinding grooves are found in rock surfaces and result from the manufacture and maintenance of ground edge tools. Given the absence of large sandstone exposures, grinding groove sites are unlikely to be present.

Burials sites
Burial sites have been recorded within the wider region. This site type is rarely located during field survey and are not predicted to be present in the subject area.

Rock Shelter Sites
Rock shelters sites are unlikely to be present in the study area given the absence of vertical stone outcrops.

Scarred and Carved Trees
Scarred and carved trees result from either domestic or ceremonial bark removal. Carved trees associated with burial grounds and other ceremonial places have been recorded in the wider region. In an Aboriginal land use context this site type would most likely have been situated on flat or low gradient landform units in areas suitable for either habitation and/or ceremonial purposes.

Bark removal by European people through the entire historic period and by natural processes such as fire blistering and branch fall make the identification of scarring from a causal point of view very difficult. Accordingly, given the propensity for trees to bear scarring from natural causes, their positive identification is impossible unless culturally specific variables such as stone hatchet cut marks or incised designs are evident and rigorous criteria with regard to tree species/age/size and specific characteristics with regard to regrowth is adopted.

Nevertheless, the likelihood of trees bearing cultural scarring remaining extant and in situ is low given events such as land clearance and bushfires. Generally scarred trees will only survive if they have been carefully protected (such as the trees associated with Yuranigh's grave at Molong where successive generations of European landholders have actively cared for them).

The subject area is has been cleared previously and this site type is unlikely to be present.
Stone Quarry and Procurement Sites
Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occur. Given the presence of stone outcrops in the proposal area this site type is may be recorded during the study.

Ceremonial Places and Sacred Geography
Burbung and ceremonial sites are places which were used for ritual and ceremonial purposes. Possibly the most significant ceremonial practices were those which were concerned with initiation and other rites of passage such as those associated with death. Sites associated with these ceremonies are burbung grounds and burial sites. Additionally, secret rituals were undertaken by individuals such as clever men. These rituals were commonly undertaken in 'natural' locations such as water holes. Ceremonial grounds are known to exist in the local area.

Contact Sites
These sites are those which contain evidence of Aboriginal occupation during the period of early European occupation. Evidence of this period of 'contact' could potentially be Aboriginal flaked glass, burials with historic grave goods or markers, and debris from 'fringe camps' where Aborigines who were employed by, or traded with the white community, may have lived or camped. The most likely location for contact period occupation sites would be places adjacent to permanent water and located in relative proximity to centres of European occupation such as towns and homesteads. The potential for such sites to be in the proposal area is possible but unlikely.

7.2.5 Field inspection methodology

In accordance with the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW, the purpose of a field survey is to record the material traces and evidence of Aboriginal land use that are, visible at or on the ground surface, or exposed in section or visible as features (e.g. rock shelters with rock-art), and to identify those

areas where it can be inferred that, although not visible, material traces have a high likelihood of being present under the ground surface.

The field inspection entailed a comprehensive pedestrian survey undertaken across the subject area. The survey was aimed at locating Aboriginal objects, areas and places. An assessment was also made of prior land disturbance, survey coverage variables (ground exposure and archaeological visibility) and the potential archaeological sensitivity of the land. The field survey was designed to assess the archaeological sensitivity of all areas where impacts are proposed. The data collected during this field assessment forms the basis for the documentation of survey results outlined in the section below.

7.2.6 Field inspection results

The entire area in which impacts would occur has undergone relatively high levels of prior disturbance associated with land clearance/agriculture and previous quarrying. This previous landuse is assessed to have caused reasonably high levels of impact to almost all ground surfaces and hence, to any Aboriginal objects which may once have been present in those areas.

Impacts in the remainder of the subject area vary. All areas have been cleared of original native vegetation and have been used for agriculture. Ground surfaces are now covered with introduced pasture species including couch and kikuyu. Remnants of farm fences and infrastructure remain. Generally the ground surfaces are uneven indicating prior disturbance. Elsewhere farm dams, water diversion channels and a well formed access road into Lot 401 have caused localised impacts. During the field survey, effective survey coverage (ESC) was variable, but generally low.

A total of area of approximately 44 hectares was assessed during the field work. Ground exposures inspected included areas of bare earth, erosion, animal burrows and vehicle tracks, and measured approximately less than 0.1 hectares in area. Of that ground exposure area, archaeological visibility inspected (the potential artefact bearing soil profile) is estimated to have been approximately 0.1 hectares. Effective Survey Coverage is calculated to have been 0.2% of the proposal area. The ESC encountered during the field survey is considered to be very low. However, areas of ground exposure with reasonable archaeological visibility (the potential artefact bearing soil profile) were frequently encountered. Given the absence of artefacts recorded, it is concluded that artefact density is likely to be extremely patchy in distribution and present in generally very low density.

No Aboriginal stone objects were recorded during the field assessment. However, Survey Unit 4, a very gently inclined simple slope adjacent to the wetland is predicted to contain artefact density in a low/moderate distribution (refer Figure 11 Location of Survey Units). For the purposes of this assessment it is described as an archaeologically sensitive landform.

Figure 11 Location of survey units

7.2.7 Consultation

A formal process of Aboriginal community consultation has been undertaken in accordance with the guidelines as set out in the NSW OEH's Aboriginal cultural heritage consultation requirements for proponents 2010.

In order to identify, notify and register Aboriginal people who may hold cultural knowledge relevant to determining the cultural significant of Aboriginal objects and/or places in the subject area, the following procedure was implemented.

Correspondence dated 4 May 2015 was sent to:

- The NSW OEH;
- Bogal Local Aboriginal Land Council (NLALC);
- Office of the Registrar, Aboriginal Land Rights Act 1983;
- The National Native Title Tribunal;
- Native Title Services Corporation Limited;
- Richmond Council.

In addition, an advertisement has been placed with the local paper (Northern Star) and appeared in the 6 May 2015 edition.

Following advice received from NSW OEH, further correspondence dated 18 May 2015 was sent to a list of known Aboriginal Parties for the Richmond Valley local Government area that OEH considered likely to have an interest in the proposal.

The Office of the Registrar Aboriginal Land Rights Act 1983 responded (no date) indicating that it did not appear that there were registered Aboriginal owners for the project area.

NTSCORP responded on 7 May 2015, indicating that they would provide our correspondence to any individuals, groups or organisations NTSCORP is aware assert traditional interest in the area.

The Bogal Local Aboriginal Land Council responded (11 May 2015) indicating that they required a survey of the area to be undertaken. We have taken this response to assume a registration of interest in the Aboriginal consultation process.

The National Native Title Tribunal responded via email on 7 May 2015 indicating that Native Title has been extinguished for the area in question given the property is freehold.

No Registrations of Interest were made by any Aboriginal Parties other than Bogal Local Aboriginal Land Council.

The Bandjalang Aboriginal Corporation Prescribed Body Corporate RNTBC administers land on behalf of the Bandjalang People. Their native title rights and interests were first recognised in the Bandjalang People #2 native title determinations of 2013. This matter recognises the Bandjalang people as having non-exclusive native title rights and interests over traditional lands on the north coast of New South Wales, at and around Evans Head.

Further enquires were made of ntscorp on 2 June 2015 advising that we had not heard from the Bandjalang Aboriginal Corporation Prescribed Body Corporate. Mr George Toona indicated that further communications would be made with this group. A ntscorp person was to meet with them in person on 4 June 2015 and was to advise on that occasion about the quarry and my attempts to communicate with them. A further email was received from Mr Toona on 11 June 2015 indicating that no comments had been received from the Bandjalang Directors about the quarry.

We discussed this matter further with Ms Rosalie Neve, NSW OEH on 12 June 2015. It was discussed that in regard to the Aboriginal site on Lot 402, an Aboriginal place nomination was in progress but not yet determined. Ms Neve advised that while no response has been received from the Bandjalang Aboriginal Corporation and we may therefore reasonably assume that there are not any issues, we should ensure that the proposal does not undermine and possible future aspirations the Corporation may have in regard to the site. Furthermore, she advised that we ensure an ongoing communications strategy is in place.

In accordance with Section 4.2 and 4.3 of the Aboriginal cultural heritage consultation requirements for proponents 2010 guidelines, information with regard to the project, proposed consultation process and assessment methodology was furnished to the Bogal Local Aboriginal Land Council for input and comment; none received.

Following a modification to the original project description, further letters were sent to the agencies on 7 August 2015 providing notification. Again following advice from OEH, a second batch of letters were sent to a list of Aboriginal groups OEH felt may have an interest in the area. No responses have been received.

7.2.8 The potential for harm from the proposed activity

The assessment considered the nature and extent of the proposed activity and any potential harm to Aboriginal areas, objects and/or places. The project would entail the removal and disturbance of a potential artefact bearing deposit and, accordingly, has the potential to cause fundamental impacts to any Aboriginal areas, places or objects. The proposed works entail ground disturbance and, accordingly, have the potential to cause impacts to any Aboriginal areas, places or objects which may be present within the zones of direct impact.

However, no Aboriginal object sites have been recorded in the proposal area other than Archaeological Sensitive Landform (ASL 1). This area will be subject to active conservation measures within the development context. Accordingly, no harm to Aboriginal objects is proposed. It is note that the previously identified Indigenous Non Disturbance Zone in which AHIMS 04-4-0142 is located will be maintained and would not be disturbed as a result of the proposal.

Ecologically Sustainable Development (ESD) is defined in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle,
(b) inter-generational equity,
(c) conservation of biological diversity and ecological integrity,
(d) improved valuation, pricing and incentive mechanisms.

The principles of ecologically sustainable development and the matter of cumulative harm have been considered for this project. Given the low levels of prior, existing and potential future impacts in the local and regional context in which the proposed activity area is situated, the majority of cultural values, including archaeological, which attach to comparable landforms and the broader landscape remain intact across the region.

No Aboriginal objects or cultural values are known to occur in the area of the proposed impacts. Considerations of ecologically sustainable development and cumulative impacts in regard to Aboriginal heritage are not necessary.

Avoidance or the mitigation of harm has not been considered as an option in relation to the proposed activities. It is considered that the significance of the Aboriginal objects is not sufficient to warrant the implementation of impact avoidance strategies. However, it is proposed that Survey Unit 4 be formalised as a Heritage Conservation Zone. A number of management strategies are possible and these are each given consideration below.

7.2.9 Management and mitigation strategies

Further Investigation

The field survey has been focused on recording artefactual material present on visible ground surfaces. Further archaeological investigation would entail subsurface excavation undertaken as test pits for the purposes of identifying the presence of artefact bearing soil deposits and their nature, extent, integrity and significance. Further archaeological investigation in the form of subsurface test excavation can be appropriate in certain situations. These generally arise when a proposed development is expected to involve ground disturbance in areas which are assessed to have potential to contain high density artefactual material and when the Effective Survey Coverage achieved during a survey of a project area is low due to ground cover, vegetation etc.

No areas of the proposal area have been identified which warrant further archaeological investigation in order to formulate appropriate management and mitigation strategies. The archaeological nature of the proposed impact areas are relatively well established. As noted above, we have assessed the impact areas to contain very low or low density distributions of artefacts and identified it to be disturbed.

Finally, it is noted that no Aboriginal objects or survey units with potential conservation value have been identified to have a high probability of being present in the subject area. Accordingly, test excavation conducted under OEH's Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010: 24) is not necessary.

Conservation

Conservation is a suitable management option in any situation, however, it is not always feasible to achieve. Such a strategy is generally adopted in relation to sites which are assessed to be of high cultural and scientific significance, but can be adopted in relation to any site type. In the case at hand, the development of a heritage conservation strategy within the area encompassed by Survey Unit 4 should be given consideration by the applicant.

Mitigated Impacts

Mitigated impact usually takes the form of partial impacts only (i.e. conservation of part of an Aboriginal site or Survey Unit) and/or salvage in the form of further research and archaeological analysis prior to impacts. Such a management strategy is generally appropriate when Aboriginal objects are assessed to be of moderate or high significance to the scientific and/or Aboriginal community and when avoidance of impacts and hence full conservation is not feasible. Salvage can include the surface collection or subsurface excavation of Aboriginal objects and subsequent research and analysis. In the case at hand, the development of a mitigated impact strategy is not considered to be essential from an archaeological perspective.

Monitoring

Monitoring during construction for the purposes of identifying cultural material that may be uncovered during earth disturbance can be implemented as a management strategy. However, monitoring is a reactive rather than proactive strategy, and as such, is not an ideal management tool in cultural heritage management. Monitoring for artefacts is not a widely accepted method of management because sites of significance can be destroyed as monitoring is taking place and because it can result in lengthy and costly delays to development works if significant cultural material is uncovered. In the case at hand, the development of a monitoring strategy is not considered necessary or appropriate.

7.2.10 Recommendations

The following conclusions and recommendations are made:

1. No Aboriginal objects have been recorded in impact areas and an Aboriginal Heritage Impact Permit is not required in respect of the proposal.
2. Section 7.2.9 of this EIS and Section 7 of the assessment (Attachment 3) sets out possible management and mitigation strategies and these should be given consideration by the proponent and the Registered Aboriginal Party. Their implementation can occur within the framework of the Aboriginal Heritage Management Plan developed for the project.
3. It is recommended that an Aboriginal Heritage Conservation Zone should be set up in the area encompassed by Survey Unit 4.
4. An Aboriginal Heritage Management Plan (AHMP) must be developed by an archaeologist, in consultation with the NSW OEH and the Registered Aboriginal Party. The AHMP must set out the procedures relating to the management and mitigation of development impacts, a protocol for the management of unexpected finds and the conservation of relevant areas outside the extraction area.
5. The AHMP would provide the framework to ensure the conservation of heritage within Survey Unit 4 and the existing Indigenous Heritage Non Disturbance Zone.

7.3 Traffic Impact and Pavement Assessment

Key findings

An assessment of the potential impacts of the project on the local road network has been undertaken (refer Attachment 4) and a summary of the key findings is provided below.

The anticipated haulage route to the Pacific Highway is via Petersons Quarry Road to Lagoon Road to Queen Elizabeth Drive to Coraki Woodburn Road to the Pacific Highway at Woodburn. Richmond Valley Council is the relevant authority for all roads within the haulage route except for the Pacific Highway. Seelems Road is an unsealed road with no posted speed limit sign. Petersons Quarry Road is a sealed one-lane road and is also without a speed limit sign. Lagoon Road is a sealed (undivided) two-lane road with a posted speed limit of 100km/h. Queen Elizabeth Drive is a sealed (undivided) two-lane road with a speed limit of 80km except for the posted school zone. The Coraki Woodburn Road is a sealed (undivided) two-lane road with a posted speed limit of 100km/h.

The trips generated by the proposed development have been estimated by adopting the following project parameters shown in Table 9 below.

Table 9 – Summary of Project Trip Generation

Total (max) haulage	1,000,000 tonnes per year
Working weeks per year	50 weeks
Working days per week	6 days
Working hours per day	13 hours
Average mass of material per vehicle	36 tonnes per vehicle
Average hourly traffic volume (IN)	= (1,000,000 / 50 / 6 / 13 / 36) = 7 vehicle per hour (vph)
Average hourly traffic volume (OUT)	7vph
Peak hour factor	3 (for the purpose of this traffic impact assessment, a peak hour factor of 3 has been adopted which is considered to be a conservative assumption)
Peak hour traffic volume (IN)	21vph
Peak hour traffic volume (OUT)	21vph

As it is anticipated that the project will commence operations in July 2016 for a period of 5 to 7 years. The design horizon year of the proposed development is 2023. The results of the assessment conducted illustrates that all key intersections along the haul route will operate within satisfactory operating conditions beyond the design horizon year with the existing geometries. Therefore no external road network improvements are required in conjunction with the proposed development.

Furthermore the assessment considered the suitability of the unsealed Seelems Road and from a traffic impact and pavement assessment sealing of Seelems Road is not recommended. However, Quarry Solutions have identified there would be benefit to sealing Seelems Road for noise and dust mitigation and therefore intend to progress that matter on a voluntary basis with Richmond Valley Council.

It is also identified that Richmond Valley Council have the authority to levy contributions where the project will, or is likely to, generate additional heavy haulage vehicle movements. The applicable rate to be levied is $1.08/tonne.

Whilst the assessment of traffic impacts associated with the project confirms that no physical upgrades of the local road network are warranted, Quarry Solutions are committed to safe driving practices and have advised that the following traffic management measures will be implemented for the project:

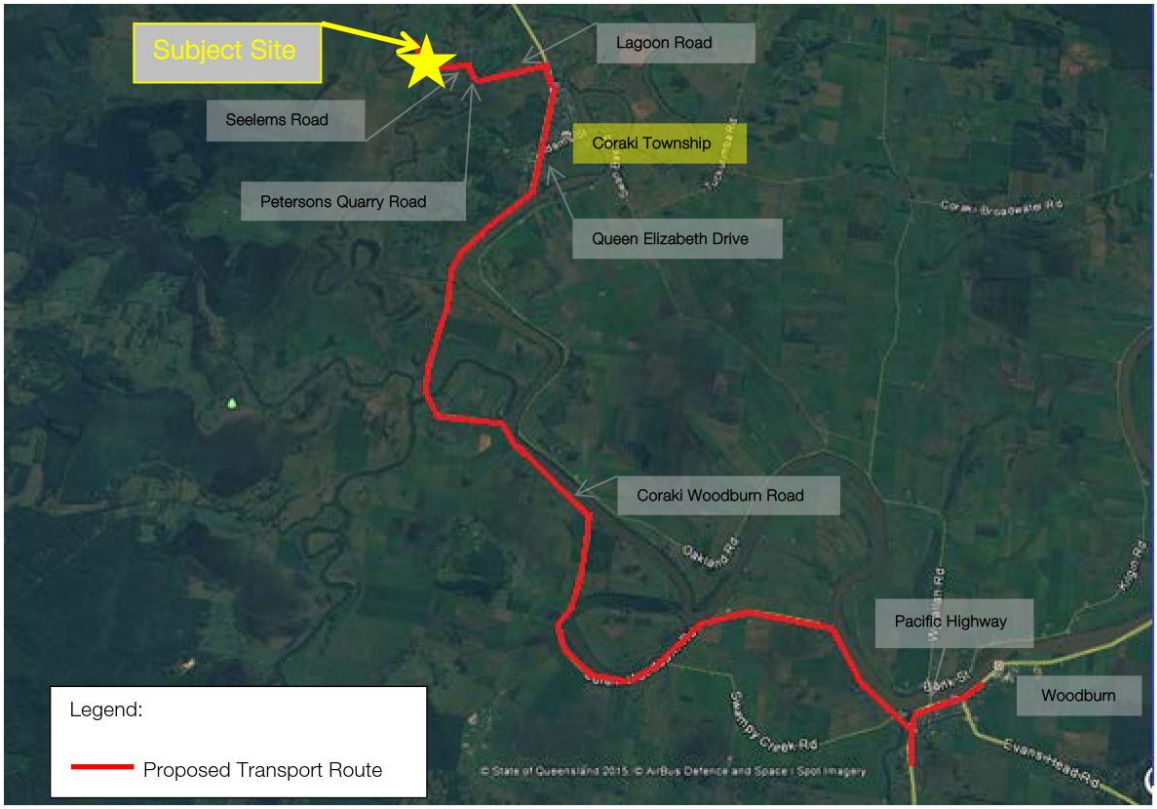
- A Driver's Code of Conduct
- Forward and drive facing cameras as well as GPS monitoring devices on all on road haulage trucks.
- GPS monitoring devices to local school buses (at Quarry Solutions cost) to monitor separation distances between on road haulage trucks and local school buses.

7.3.1 The transport route

The proposed internal transport route, shown on Figure 2 and Drawing 1837.027 Conceptual Site Layout Plan, comprises the haul vehicle drivers entering the site via Seelems Road (the section fronting Lot 407 of DP1166287) and exiting the site via Petersons Quarry Road; the haul vehicles will circulate the site in a clockwise direction (one-way flow). The proposed external transport route from the site to the Pacific Highway, Woodburn is via Petersons Quarry

Road, Lagoon Road, Queen Elizabeth Drive, Coraki Woodburn Road and thence the Pacific Highway. The proposed external transport route is illustrated in Figure 12 The external transport route.

Figure 12 The external transport route



7.3.2 Existing road network

The hierarchical classification and characteristics of roads in the vicinity of the subject site are described in Table 10 below.

Table 10 – Existing Local Road Hierarchy

Road	Speed limit	Characteristics	Authority
Seelems Road[1]	-*	Unsealed road	Richmond Valley Council
Petersons Quarry Road	-*	Sealed road	Richmond Valley Council
Lagoon Road	100km/h	Sealed (undivided) two-lane road	Richmond Valley Council
Queen Elizabeth Drive	80km/h**	Sealed (undivided) two-lane road	Richmond Valley Council
Coraki Woodburn Road	100km/h	Sealed (undivided) two-lane road	Richmond Valley Council
Pacific Highway	50km/h***	Sealed (undivided) two-lane road	Roads and Maritime Services

Note:
1Seelems Road is the road section extending to Lot 407 of DP1166287 up to the site boundary, it is approximately 380m long from Petersons Quarry Road
**Speed limit sign is not present.*
***Speed limit varies; the speed limit reduces to 40km/h from 8:00am to 9:00am and from 2:30pm to 4:00pm on school days within the school zone.*
****Speed limit of Pacific Highway near the Coraki Woodburn Road / Pacific Highway intersection.*

The typical cross-section of Seelems Road, Petersons Quarry Road, Lagoon Road, Queen Elizabeth Drive and the Coraki Woodburn Road are shown below.

Plate 6. Seelems Road looking east towards Petersons Quarry Road

Plate 7. Petersons Quarry Road looking north

Plate 8. Lagoon Road looking west

Plate 9. Queen Elizabeth Drive looking north

Plate 10. Queen Elizabeth Drive looking south near school zone

Plate 11. Coraki Woodburn Road looking north-west

7.3.3 Base traffic volumes

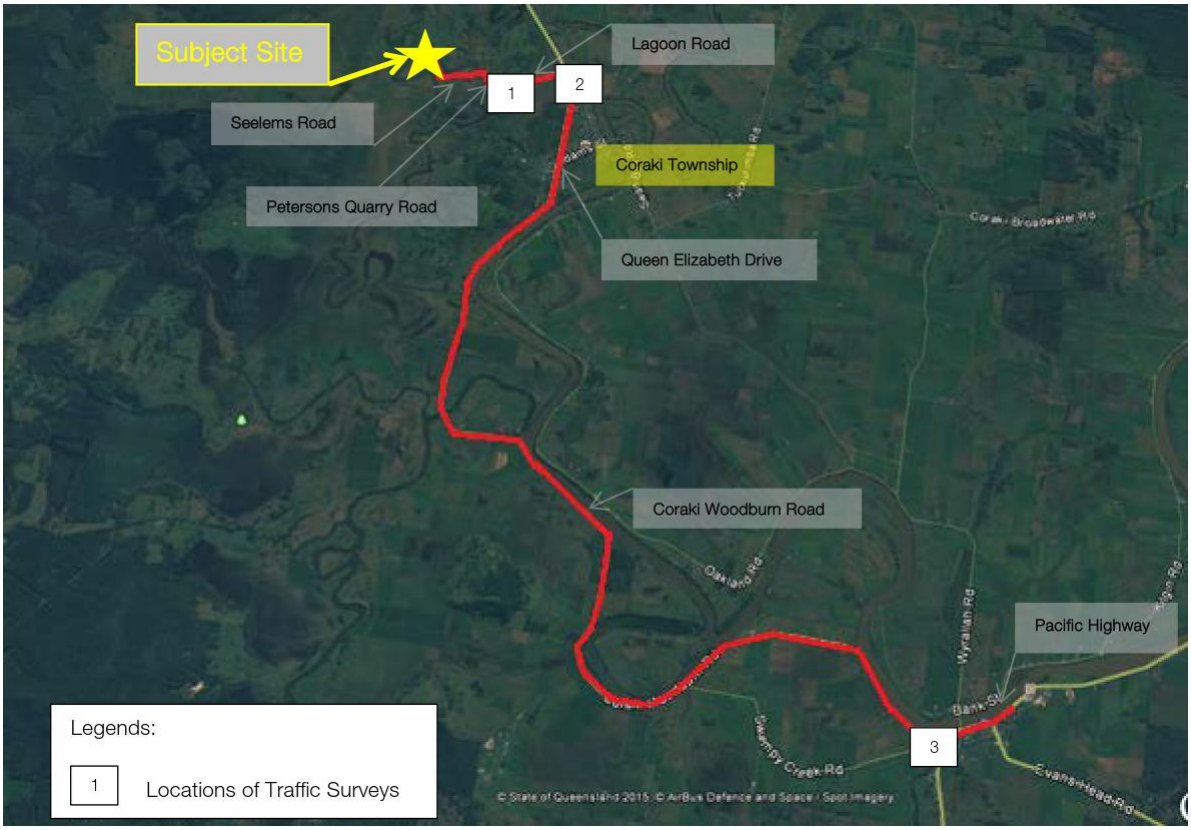
As a part of this study, traffic surveys were commissioned to be undertaken by Austraffic at the following intersections in the vicinity of the site on Thursday 21st May 2015 from 6:30am to 10:30am and from 2:00pm to 6:00pm. The locations of traffic surveys are illustrated in Figure 13 Locations of traffic surveys.

- Intersection 1: Petersons Quarry Road / Lagoon Road;
- Intersection 2: Lagoon Road / Queen Elizabeth Drive; and
- Intersection 3: Coraki Woodburn Road / Pacific Highway.

The detailed results of these traffic surveys are included in Appendix C of Attachment 4.

It is noted that it is the industry accepted traffic engineering practice to undertake the traffic impact assessment for a development of a small to medium scale based on the results of a single day's traffic survey. It is of course understood that there are daily / seasonal variations of traffic volumes at intersections or road corridors, however, the single day traffic survey as utilised in such cases provides suitable information in relation to the general traffic volumes / operational characteristics of intersections and provides a good indication of how the affected intersections would operate with and without the proposed development. In this instance, the survey date was carefully chosen to avoid school holidays and Mondays / Fridays, so that the results of the survey could best represent the average traffic volumes of a normal weekday working day.

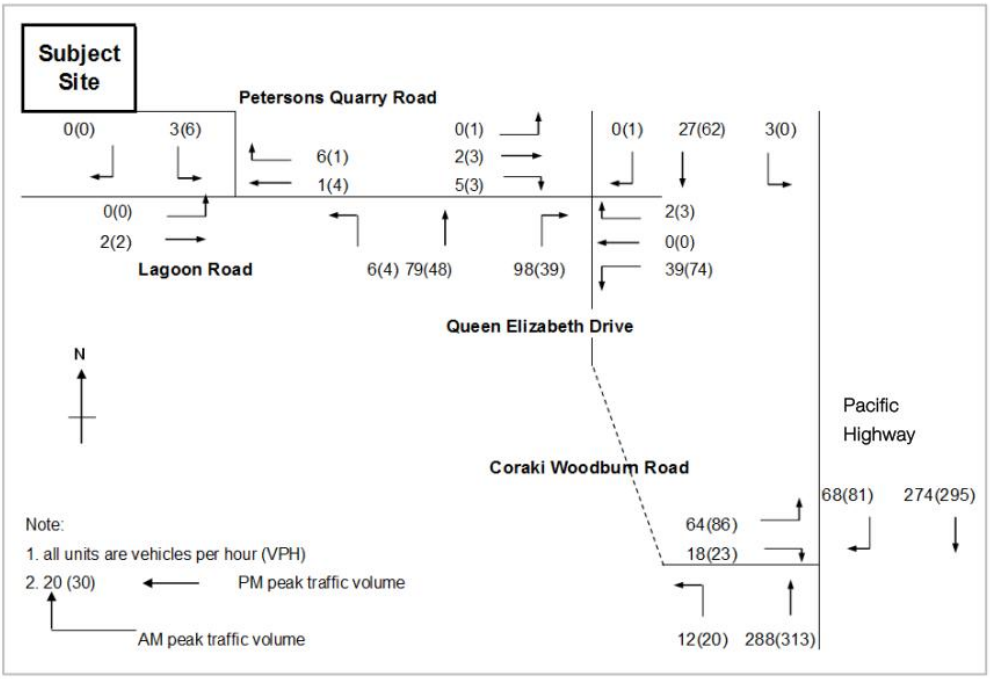
Figure 13 Locations of traffic surveys



The observed AM and PM peak hour periods of traffic at the intersections are summarised in Table 4-1 of Attachment 4. The individual peak hour of traffic volumes of each intersection have been adopted for the analyses outlined in this traffic impact assessment. Accordingly traffic volumes will not match from intersection to intersection, however, it is considered that this approach will ensure the worst-case-scenario has been assessed for each location.

Figure 14 illustrates the 2015 observed traffic volumes during the peak hour periods.

Figure 14 2015 Observed traffic volumes



7.3.4 Cumulative impact and adjacent developments

From the point of view of undertaking holistic traffic loading on the road network, it is noted that adjacent to the subject site there is an industrial site and the Petersons Quarry. The survey undertaken on Thursday 21st May 2015 would include the traffic generated by the adjoining industrial site.

After the completion of the traffic survey, MRCagney was advised that the Petersons Quarry only operated on Wednesdays; therefore, the traffic generated by the Petersons Quarry would not have been included in the background traffic survey.

Based on results of intersection performance analysis (SIDRA analysis), included in Section 6 of Attachment 4, it is clear that all affected intersections have ample reserve capacity with and without the proposed development in the design year. All affected intersections would operate satisfactorily even if the total traffic volume generated was to double; therefore, there are no operational concerns with both the Petersons Quarry and the proposed development operating simultaneously.

The pavement impact of a development should be assessed based on the Annual Average Daily Traffic (AADT), not daily traffic volumes of a single survey day, therefore, the AADT (2015) on the adjacent road network already essentially includes the traffic generated by the Petersons Quarry.

Possible pavement contributions associated with the existing Petersons Quarry is a separate issue. As noted in Section 8 of Attachment 4, the pavement impact / contribution of the proposed development is calculated based on Section 94 Heavy Haulage Contributions Plans 2013.

7.3.5 Based traffic growth

It is anticipated that the proposed quarry will commence operations in July 2016 for 5 to 7 years. Therefore, the design horizon year of the proposed development would be 2023 (the last operational year of the proposed development).

For the purpose of this assessment, an average growth rate of 3% p.a. (compound) has been adopted to estimate future background traffic volumes. The growth of the traffic volumes on Petersons Quarry Road is assumed to be zero without the proposed development. Calculations of the base traffic volumes are provided in Attachment 4.

Figures 15 and 16 illustrate the 2016 and 2023 base traffic volumes without the proposed development during the peak hour periods that have been used as the basis of the traffic assessment outline herein.

Figure 15 2016 Base traffic volumes without the proposed development

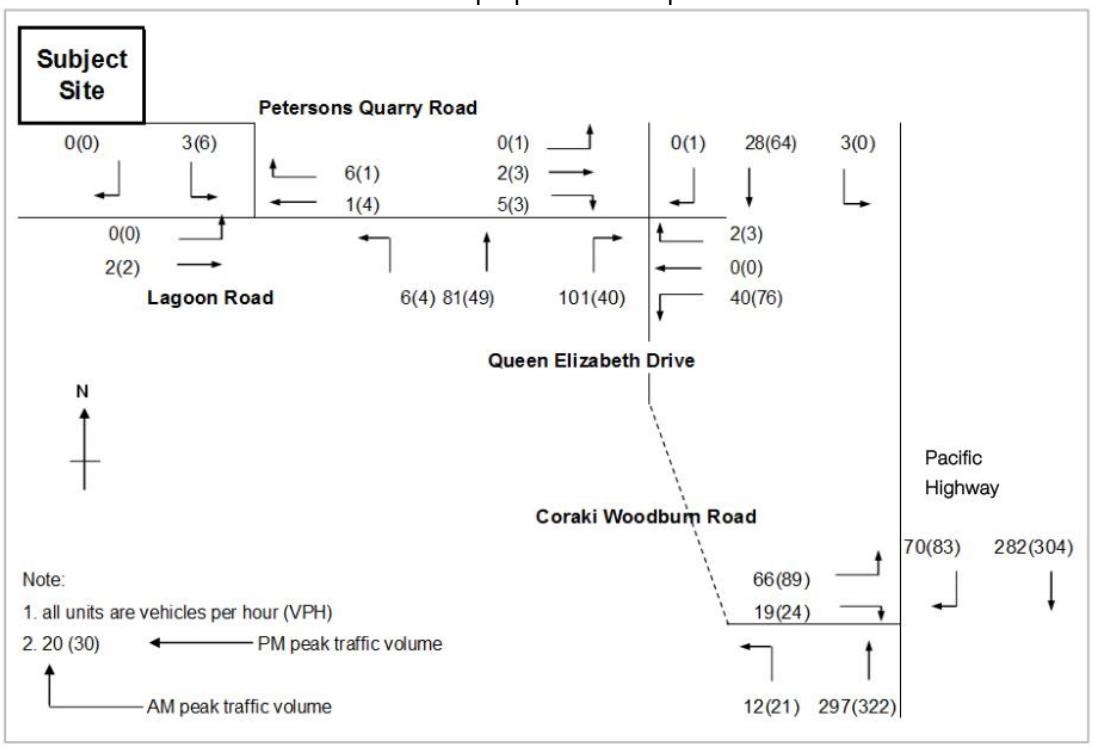
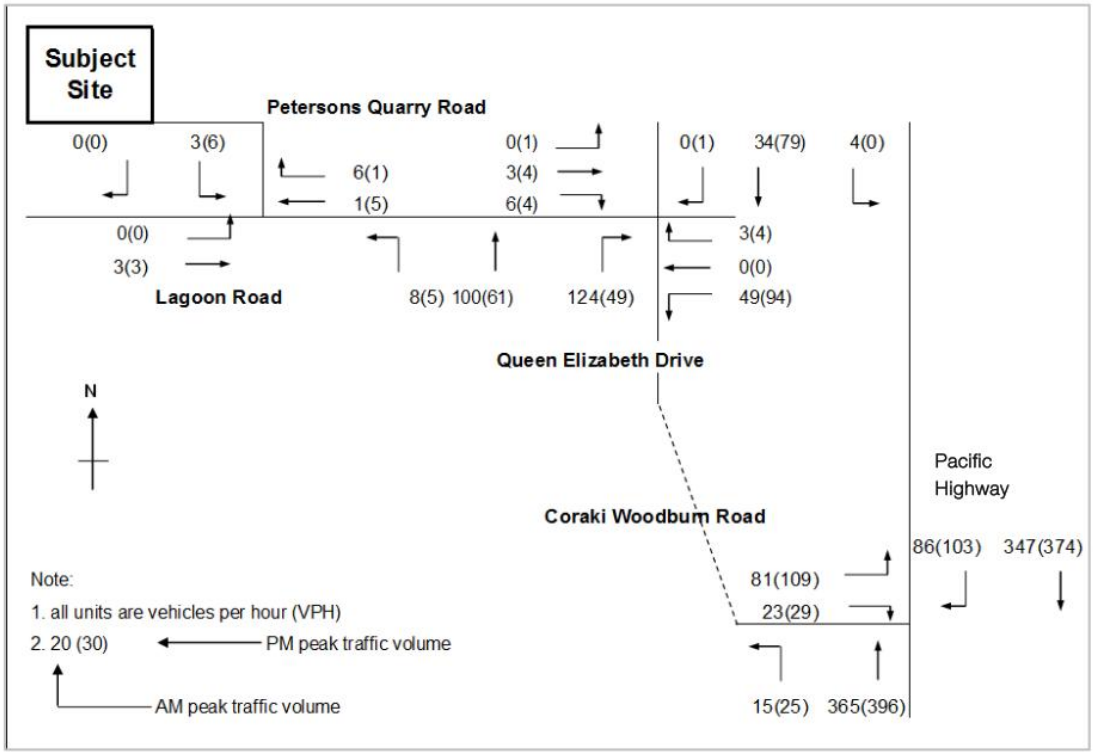


Figure 16 2023 Base traffic volumes without the proposed development



7.3.6 Traffic volumes generated by the project

The maximum annual production volume of the project is anticipated to be 1M tonnes per year. It is not possible to forecast the future actual annual peak production volume at this planning stage, therefore, the maximum production threshold (1M tonnes per year) has been adopted to assess the traffic impact of the site on the surrounding road network; this is considered to be a conservative assumption. We have been advised that the proposed operating hours of the loading and hauling activities would be from 6:00am to 7:00pm from Monday to Saturday; there would be no operation on Sundays as well as major public holidays, such as Anzac Day, Good Friday, Easter Monday or Christmas Day.

The trips generated by the project have been estimated by adopting the following project parameters. Whilst a number of these parameters have been based on assumptions, these are considered reasonable and reflective of the likely operations of the proposed development. Therefore, the resultant volume forecasts are considered appropriate for the purposes of this assessment.

Total (max.) haulage*:	1,000,000 tonnes per year;
Working weeks per year:	50 weeks;
Working days per week:	6 days;
Working hours per day:	13 hours;
Average mass of material per vehicle**:	36 tonnes per vehicle;
Average hourly traffic volume (IN):	= [1,000,000 / 50 / 6 / 13 / 36] = 7vph; and
Average hourly traffic volume (OUT):	7vph (assumed same as IN traffic volumes).

*MRCagney has been advised that the maximum production threshold would be 1M tonnes per year.
**MRCagney has been advised that 36t payload truck & dog would be used.

It is noted that the project would generate an average hourly traffic volume of 7vph (IN) and 7vph (OUT). However, in order to ensure sufficient infrastructure is proposed to be provided to cater for the 'worst-case' peak design scenario, it is conservatively assumed that the proposed development would generate more than the average hourly traffic volumes during the peak hour periods by introducing the concept of peak hour factor.

Peak hour factor***:	3 (for the purpose of this traffic impact assessment, a peak hour factor of 3 has been adopted);
Peak hourly traffic volume (IN):	= [1,000,000 / 50 / 6 / 13 / 36 x 3] = 21vph; and
Peak hourly traffic volume (OUT):	21vph (assumed same as IN traffic volumes).

***Peak hour factor is the ratio of the absolute peak operating conditions to the average operating conditions of a peak production year. This represents what is considered to be the 'worst-case' peak design scenario and has been used as the basis of this traffic impact assessment.

It is understood that there will be total of 15 on-site staff (on different shifts) working at the project. Whilst the staff may not necessarily arrive / leave the site during the AM and PM road peak hour periods, it is conservatively assumed that approximately one-third of staff would arrive at the site during the AM peak hour period and leave the site during the PM peak hour period; ie. staff of the site would generate 5vph during the AM peak hour period (5vph IN + 0vph OUT) and the PM peak hour period (0vph IN + 5vph OUT). The trips generated by the staff are in addition to the trips generated by the hauling activities.

It is understood that the quarry is proposed to predominately supply materials to the scheduled upgrade works on the Pacific Highway at Woodburn. It is understood that all of the quarried materials will be delivered to the Pacific Highway to the north of the Pacific Highway / Coraki Woodburn Road intersection in the early stage of the Pacific Highway upgrade project; and all of the quarried materials will be delivered to the Pacific Highway to the south of the Pacific Highway / Coraki Woodburn Road intersection in the latter stage of the project. The location of the housing of staff working at the site cannot be known at this stage; however, it is conservatively assumed the staff come from the north during the early stage, and vice versa in the latter stage in this traffic assessment; which are considered as the 'worst-case' scenarios.

The peak hourly trips forecast to be generated by the proposed development based on the aforementioned assumptions are illustrated in Figure 17 (the early stage) and Figure 18 (the latter stage).

Figure 17 Trips forecast to be generated by the project (early stages)

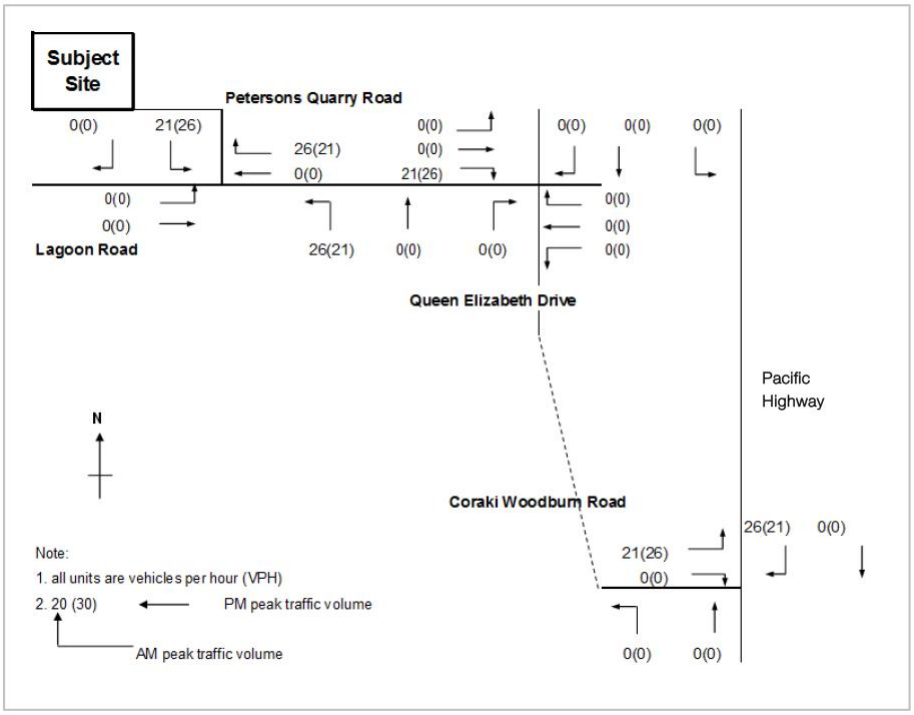
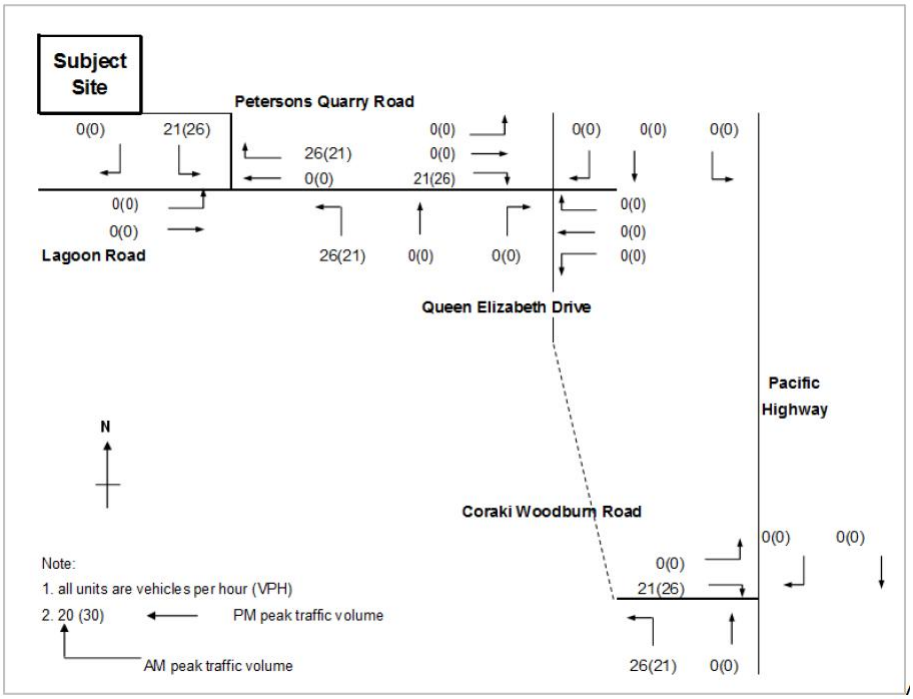


Figure 18 Trips forecast to be generated by the project (later stages)



Adding the forecast development-generated traffic to the base traffic volumes, the 2016 and 2023 design traffic volumes (the early stage) are illustrated in Figures 19 and 20 respectively. Similarly, the 2016 and 2023 design traffic volumes (the latter stage) are illustrated in Figures 21 and 22 respectively.

Figure 19 2016 Design traffic volumes with the project (early stages)

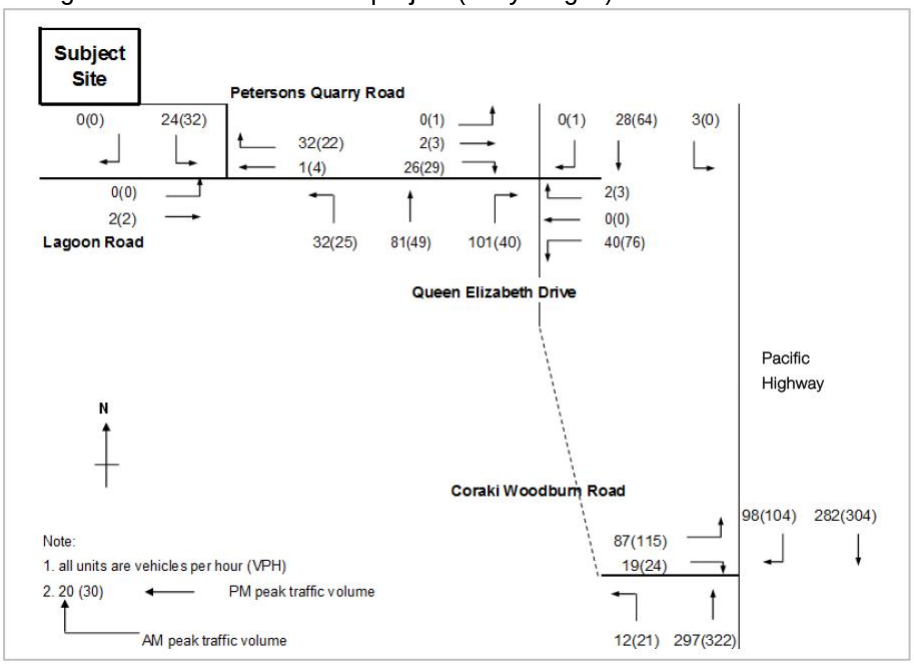


Figure 20 2023 Design traffic volumes with the project (early stages)

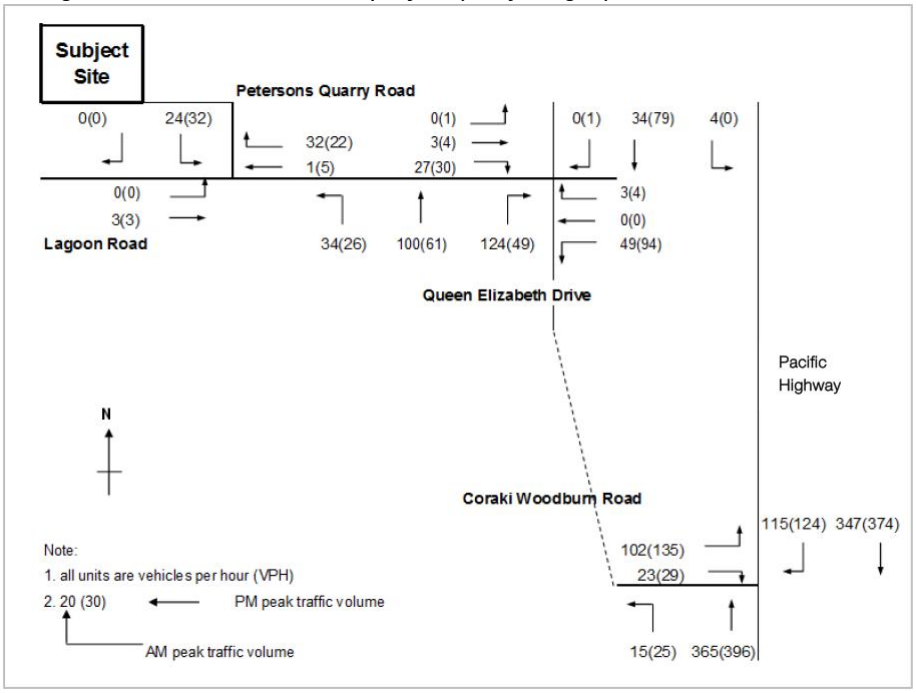


Figure 21 2016 Design traffic volumes with the project (later stages)

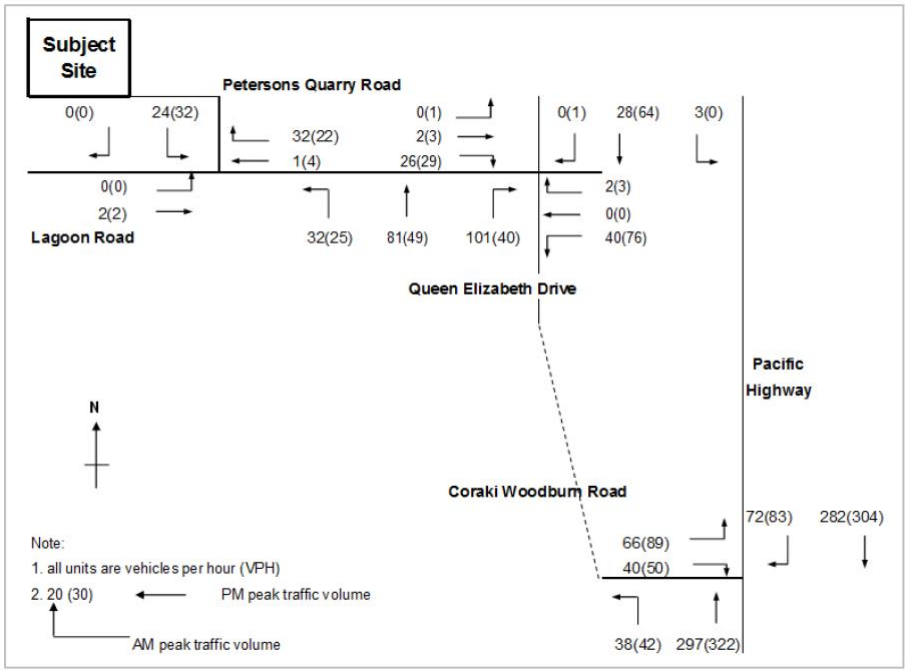
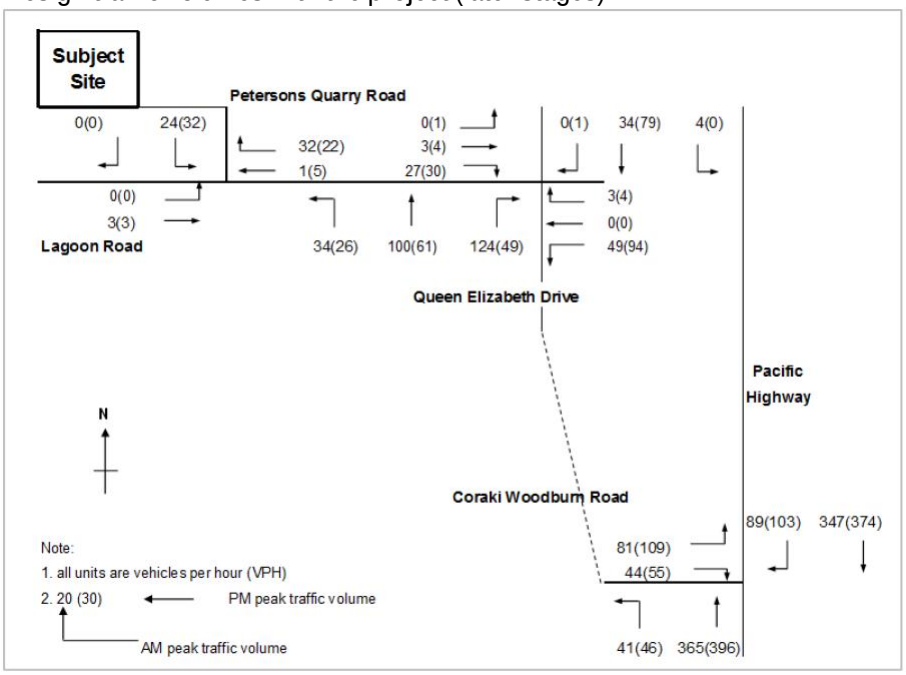


Figure 22 2023 Design traffic volumes with the project (later stages)



7.3.7 Intersection performance

To quantify the impact of the proposed development on the operation of the external road network, future operation of the following key intersections has been assessed in Attachment 4:

- Intersection 1: Petersons Quarry Road / Lagoon Road;
- Intersection 2: Lagoon Road / Queen Elizabeth Drive; and
- Intersection 3: Coraki Woodburn Road / Pacific Highway.

The following is a summary of the findings of the analyses which is provided in greater detail in Attachment 4.

Intersection 1: Petersons Quarry Road / Lagoon Road

The configuration of the Petersons Quarry Road / Lagoon Road intersection modelled in the SIDRA analyses is shown in Figure 6-1 of Attachment 4. The number of vehicles turning right from Petersons Quarry Road onto Lagoon Road during the entire traffic survey period was zero; it is anticipated that the right turn movement from Petersons Quarry Road will continue to be minimal. Therefore, no right turn on Petersons Quarry Road has been modelled in the SIDRA analyses for simplicity; not withstanding this assumption, review of the results of the analysis will clearly reveal that such an assumption is immaterial.

Results of the analyses of the operation of the Petersons Quarry Road / Lagoon Road intersection for the base and design scenarios in 2016 (the opening year of the site) and 2023 (design year - the last operational year of the site) are summarised in Tables 6-1 and 6-2 of Attachment 4 respectively. It is noted that the traffic generation / distribution at this intersection are the same for both the early and latter stages of the Pacific Highway upgrade project. Detailed results are provided within Appendix B of Attachment 4.

The results provided in Tables 6-1 and 6-2 of Attachment 4 indicate that the Petersons Quarry Road / Lagoon Road intersection would continue to operate well within satisfactory operating conditions beyond the design horizon year (2023) with development of the subject proposal.

All development-related trips entering Petersons Quarry Road will turn right from Lagoon Road. It is also noted that the through traffic on Lagoon Road at the Petersons Quarry Road / Lagoon Road intersection will be less than 10vph during the AM and PM peak hour periods in 2023. Therefore, no right turn lane treatment is considered to be necessary at the Petersons Quarry Road / Lagoon Road intersection due to the extremely low through traffic on Lagoon Road.

The intersection is forecast to operate safety and efficiently for the foreseeable future. As alluded to in Section 4 of Attachment 4, clearly this intersection would also accommodate traffic associated with the existing Petersons Quarry.

Intersection 2: Lagoon Road / Queen Elizabeth Drive

The existing configuration of the Lagoon Road / Queen Elizabeth Road intersection modelled in the SIDRA analyses is shown in Figure 6-2 of Attachment 4.

Results of the analyses of the operation of the Lagoon Road / Queen Elizabeth Road intersection for the base and design scenarios in 2016 (the opening year of the site) and 2023 (design year - the last operational year of the site) are summarised in Tables 6-3 and 6-4 of Attachment 4 respectively. It is noted that the traffic generation / distribution at this intersection are the same for both the early and latter stages of the Pacific Highway upgrade project. Detailed results are provided within Appendix B of Attachment 4.

The results provided in Tables 6-3 and 6-4 of Attachment 4 indicate that the Lagoon Road / Queen Elizabeth Drive intersection would continue to operate well within satisfactory operating conditions beyond the design horizon year (2023) with development of the subject proposal. Traffic volumes are sufficiently low so as not to warrant turn lane treatments. As alluded to in Section 4 of Attachment 4, clearly this intersection would also accommodate traffic associated with the existing Petersons Quarry.

Intersection 3: Coraki Woodburn Road / Pacific Highway

The existing Coraki Woodburn Road / Pacific Highway intersection is an old-style right turn Type B geometry, it operates in a similar fashion to an intersection with an auxiliary right turn lane; therefore, for the purpose of this assessment, the Coraki Woodburn Road / Pacific Highway intersection has been modelled as an intersection with an auxiliary right turn lane in the SIDRA analyses as shown in Figure 6-3 of Attachment 4. It is noted that this assumption does not indicate that a modified treatment for the right turn is required; it simply is the adopted modelling approach, which is generally accepted as being appropriate for such a circumstance.

Results of the analyses of the operation of the Coraki Woodburn Road / Pacific Highway intersection for the base and design scenarios in 2016 (the opening year of the site) and 2023 (design year - the last operational year of the site) for the early stage of the Pacific Highway upgrade project are summarised in Tables 6-5 and 6-6 of Attachment 4

respectively. The early stage of the Pacific Highway upgrade project will be completed before 2023, therefore, it is considered to be a conservative assumption to adopt the design year of 2023 for the early stage scenarios.

Results of the analyses of the operation of the Coraki Woodburn Road / Pacific Highway intersection for the base and design scenarios in 2016 and 2023 for the latter stage of the Pacific Highway upgrade project are summarised in Tables 6-7 and 6-8 of Attachment 4 respectively. Detailed results are provided within Appendix B of Attachment 4.

The results provided in Tables 6-5 to 6-8 of Attachment 4 indicate that the Coraki Woodburn Road / Pacific Highway intersection would continue to operate within satisfactory operating conditions beyond the design horizon year (2023) with the proposed development in all scenarios. As alluded to in Section 4 of Attachment 4, clearly this intersection would also accommodate traffic associated with the existing Petersons Quarry.

The identified maximum design queue lengths of the right turn movement from the Pacific Highway (the northern approach of the intersection) and the left turn movement from the Pacific Highway (the southern approach of the intersection) would be typically be just one vehicle during the both AM and PM peak hour periods in 2023; it is considered that the existing old-style Type B treatment for the right turn movement on the northern approach and the existing left turn lane on the southern approach would continue to operate safely and efficiently in the future, particularly being mindful of the proposed lifespan of the project.

7.3.8 Seelems Road

The section of Petersons Quarry Road between Seelems Road and the Petersons Quarry Road / Lagoon Road intersection is sealed.

Seelems Road is the road section extending to Lot 407 of DP1166287 up to the site boundary; it is approximately 380m long from Petersons Quarry Road. It is currently unsealed.

As previously discussed, the haul vehicle drivers will enter the site via Seelems Road (the section fronting Lot 407 of DP1166287) and exit the site via Petersons Quarry Road; the haul vehicles would circulate the site in clockwise direction (one-way flow).

The assessment included in this section of this report has been prepared to determine whether Seelems Road is required to be sealed in conjunction with the project.

Richmond Valley Council's Planning Scheme does not provide clear guideline in relation to how much traffic would trigger the need for provision of a sealed road. Therefore, reference has been made to the document "Upgrading of Unsealed Rural Roads to Sealed Standard" of Rockhampton Regional Council; this is considered to be an appropriate parallel and we have found use of the recommendations therein to be useful. This documents suggests that "*Traffic volumes – An unsealed rural road must be in the range of 150-500 AADT (Annual Average Daily Traffic). A road will not be considered for a minimum standard if there is less than 150 AADT unless there are significant issues shown in assessment score. A road that has an AADT greater than 500 will qualify for a full road design*".

The analysis is mindful that the proposed development will be the primary user of Seelems Road; and the proposed development will only operate until 2023. The identified maximum allowable Annual Average Daily Traffic Volumes (AADT) of 500vpd for an unsealed road has been adopted as an upper threshold for the purpose of this pavement assessment. The analysis also conservatively uses the maximum production rate rather than the average which would normally be considered appropriate in consideration of Annual Average Daily Traffic volumes (AADT).

As noted, the proposed development will be in operation until 2023. Therefore, the design year of the pavement requirement of Seelems Road is 2023.

The future AADT of Seelems Road is calculated as below:
Step 1: Operational years of the proposed development = from Year 2016 to Year 2023;
Step 2: Base daily traffic volumes in 2015* = 80vpd;
Step 3: Growth Rate** = 0%;

Step 4: Base daily traffic volumes in 2023 = 80vpd;
Step 5: Total (max.) haulage*** = 1,000,000 tonnes per year;
Step 6: Working weeks per year = 50 weeks;
Step 7: Working days per week = 6 days;
Step 8: Average mass of material per vehicle**** = 36 tonnes per vehicle;
Step 9: Average daily traffic volume (haulage vehicles – IN trips only) = [1,000,000 / 50 / 6 / 36] = 93vpd ; and
Step 10: 2023 AADT (with the proposed development) = [80 + 93] = 173vpd*****.

*Assumes 2015 daily traffic volumes = ((2015 AM peak hour traffic volume + 2015 PM peak hour traffic volume) x 5) = ((9 + 7) x 5) = 80vpd.
**Assumes the growth rate of traffic volumes of Seelems Road (without the proposed development) is 0% p.a. (compound).
***MRCagney has been advised that the maximum production threshold would be 1M tonnes per year.
****MRCagney has been advised that 36t payload truck & dog would be used.
*****Staff tips are not anticipated to use Seelems Road.

Therefore the results of above calculations (including the conservative assumption of maximum production every year) indicate that the 2023 daily traffic with the project is in order of 173vpd; whilst this traffic stream has a relatively high proportion of heavy vehicles, the fact that it is based on a conservative methodology and is somewhat less than 500vpd leads to the appropriate conclusion that providing a gravelled pavement is appropriate. Sealing of Seelems Road is not recommended to be required to cater for the forecast traffic generated by the project.

7.3.9 Heavy haulage contribution

Section 94 Heavy Haulage Contributions Plans 2013 enables "*Richmond Valley Council to levy developer contributions under section 94 of the Environmental planning and Assessment Act 1979 where the anticipated development will, or is likely to, generate additional heavy haulage vehicle movements, such as from mines and extractive industries*".

The road / traffic impact of the proposal has been assessed based on the maximum production volumes (1,000,000 tonnes per year) to ensure satisfactory operation of road infrastructure components at all times.

However, the pavement impact and the pavement contribution for this proposal should be assessed based on the average production over the operational years of the proposal. It is not considered appropriate to utilise maximum production rates for this calculation as pavement impact is fundamentally based on average daily ESAs and cumulative pavement impacts. The average production rate of the proposed development would be 800,000 tonnes per year from 2016 to 2023. In practical terms, the levy could be applied on the basis of actual tonnages with a reporting protocol put in place.

Section 94 Heavy Haulage Contributions Plans 2013 notes that an extractive industry use with the proposed annual extraction is required to pay $1.08 / tonne for the pavement impact likely to be generated on Council's roads.

7.4 Biodiversity

An assessment of the biodiversity values in and around the proposed development footprint of the project has been undertaken (refer Attachment 5) to inform decision making regarding the avoidance and mitigation of impacts on significant biodiversity values resulting from the project.

Key findings

A preliminary assessment of ecological values on the proposed development site concluded that the area of the proposed development footprint was unlikely to hold any notable value for flora or fauna species of significance and, therefore, the requirements for biodiversity offsets under the BioBanking process was also unlikely. Consequently, the OEH confirmed that the Framework for Biodiversity Assessment would not need to be used to assess the biodiversity values and associated impacts, subject to the results of further investigations. The DPI also confirmed there are no fisheries issues and no aspects of the works trigger the need for any approvals under the NSW *Fisheries Management Act 1994*, provided the nearby wetland was not impacted.

The biodiversity values of the study area were assessed through a desktop review of available information together with a field survey conducted by two ecologists over one day. The survey primarily involved the assessment of all native vegetation, habitats and other landscape features on and adjacent to the proposed site development footprint for informing subsequent mapping and value assessments, and determining the need for any further assessment for

threatened species. Given the small size of the site, all vegetation communities, habitats and flora species were able to be assessed and accounted for during the survey.

The study area occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion, and includes the Lamington Volcanic Slopes, Grafton-Whiporie Basin and Clarence-Richmond Alluvial Plains Mitchell Landscapes.

Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands, none of which are recognised as "important" wetlands. Wetlands also occur to the east and north-east of the study area, known locally as Kennedy's Swamp. No state or regionally significant biodiversity links are recognised as occurring within the study area, although vegetation associated with Seelems Creek may act as a local biodiversity link.

Native vegetation recorded during the field survey was restricted to the western and central portions of the study area, as well as to the north-east. The ground-truthed extent was found to match that shown in aerial imagery for the site, which confirms that the proposed development footprint is largely devoid of native vegetation and has been used for grazing livestock and existing quarrying operations.

The field survey identified four native vegetation types within or in close proximity to the study area but outside the proposed development footprint, all of which are recognised as Endangered Ecological Communities (EECs):

- Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast – a component of the "Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions" EEC. Found to be in moderate condition.
- Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast – a component of the "Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion" EEC. Found to be in moderate condition.
- Paperbark swamp forest of the coastal lowlands of the North Coast – a component of the "Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC. Found to be in moderate condition.
- Coastal freshwater meadows and forblands of lagoons and wetlands – a component of the "Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC. Found to be in good condition.

These native vegetation communities all occur outside of the proposed development footprint. None of the vegetation on the study area is recognised as a Threatened Ecological Community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other native vegetation recorded onsite occurs as scattered paddock trees, planted amenity screens alongside access tracks, or as minor components within otherwise heavily disturbed and exotic-dominated patches of regrowth. Camphor Laurel (*Cinnamomum camphora*) and Lantana (*Lantana camara*) are dominant features of the latter.

Four specimens of *Macadamia tetraphylla* (Rough-shelled Bush Nut) were recorded during the field survey, a species currently listed as Vulnerable under both the NSW *Threatened Species Conservation Act 1995* (TSC Act) and EPBC Act. The specimens occur together, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the study area. These plants are either relicts of a dry rainforest or forested wetland community that once occupied that part of the site, or they have propagated from seeds dispersed from nearby communities. No other threatened flora species were recorded during the field survey, despite targeted searching within all habitat types (including comprehensive searches within the proposed development footprint), and despite the majority of species being detectable throughout the year.

The degraded habitats present within the area of the proposed development footprint provide very limited habitat value for threatened fauna species. A number of threatened fauna species have the potential to occur within the habitats present within the study area, at least as transient visitors during foraging (particularly birds and bats). Black-necked Stork (*Ephippiorhynchus asiaticus*) (Endangered: TSC) and Comb-crested Jacana (*Irediparra gallinacea*) (Vulnerable: TSC Act) are also known to occur on the site from previous records, and the study area continues to provide suitable habitat for these species.

Forest Red Gums (Eucalyptus tereticornis) within the open forest habitat to the north-east of the study area showed scratches consistent with those of Koala (*Phascolarctos cinereus*) (Vulnerable: TSC Act and EPBC Act). No evidence of Koala occurrence was found within the study area, and although it is possible this species may also occasionally utilise food trees occurring within the open paddock and fringing the wetlands, these areas are considered to be of less value to the species than the habitats occurring off-site. The results of the field survey generally support the Richmond Valley Council's Local Environmental Plan mapping of relative biodiversity importance in that the far western and central parts of the study area and areas to the north-east contain native vegetation and associated habitat values for native fauna, including species of conservation significance. The results of the field survey also generally support the Koala Habitat Atlas mapping in that the vegetation in the north-east well outside the proposed extraction and stockpiling areas offers the highest value Koala habitat, with less valuable potential habitat occurring on the fringes of the wetlands (Richmond Valley Council 2015).

The proposed site development footprint (incorporating the Petersons Quarry) has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation recognised as native vegetation communities that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. As a result potential cumulative impacts from the operation of both the Petersons Quarry and the project have been considered in the design of the project. Subsequently, no EECs, wetlands or important habitat for threatened flora and fauna species will be directly impacted. Buffers will be retained between the recognised vegetation communities (and associated EECs and wetlands) and the edge of the proposed site disturbance footprint to further prevent secondary impacts.

In response to the survey results, the original footprint was redesigned to avoid the clearing of four Macadamia tetraphylla specimens, with a 25 m buffer to be established and maintained around the plants. This development design, along with further management actions proposed to avoid and mitigate impacts to these plants, suggests any impacts are highly unlikely to be significant.

Implementation of a number of other mitigation measures is also recommended to reduce impacts on native flora and fauna to levels that will not cause significant or permanent harm. This includes the development and implementation of an Environmental Management Plan that includes components to reduce secondary impacts on terrestrial flora, fauna and ecosystems.

Overall, the project is not expected to result in the direct loss of any significant biodiversity values and, once the proposed mitigation measures are implemented, the remaining impacts of the project on terrestrial ecological values are predicted to be minor or negligible, particularly in the context of existing site conditions and current impacts from previous land clearing, weed invasion and the presence of livestock. Hence offsets to compensate for residual impacts are assessed to be unnecessary, and a referral to the Commonwealth in relation to impacts on species listed under the EPBC Act is not considered necessary at this time.

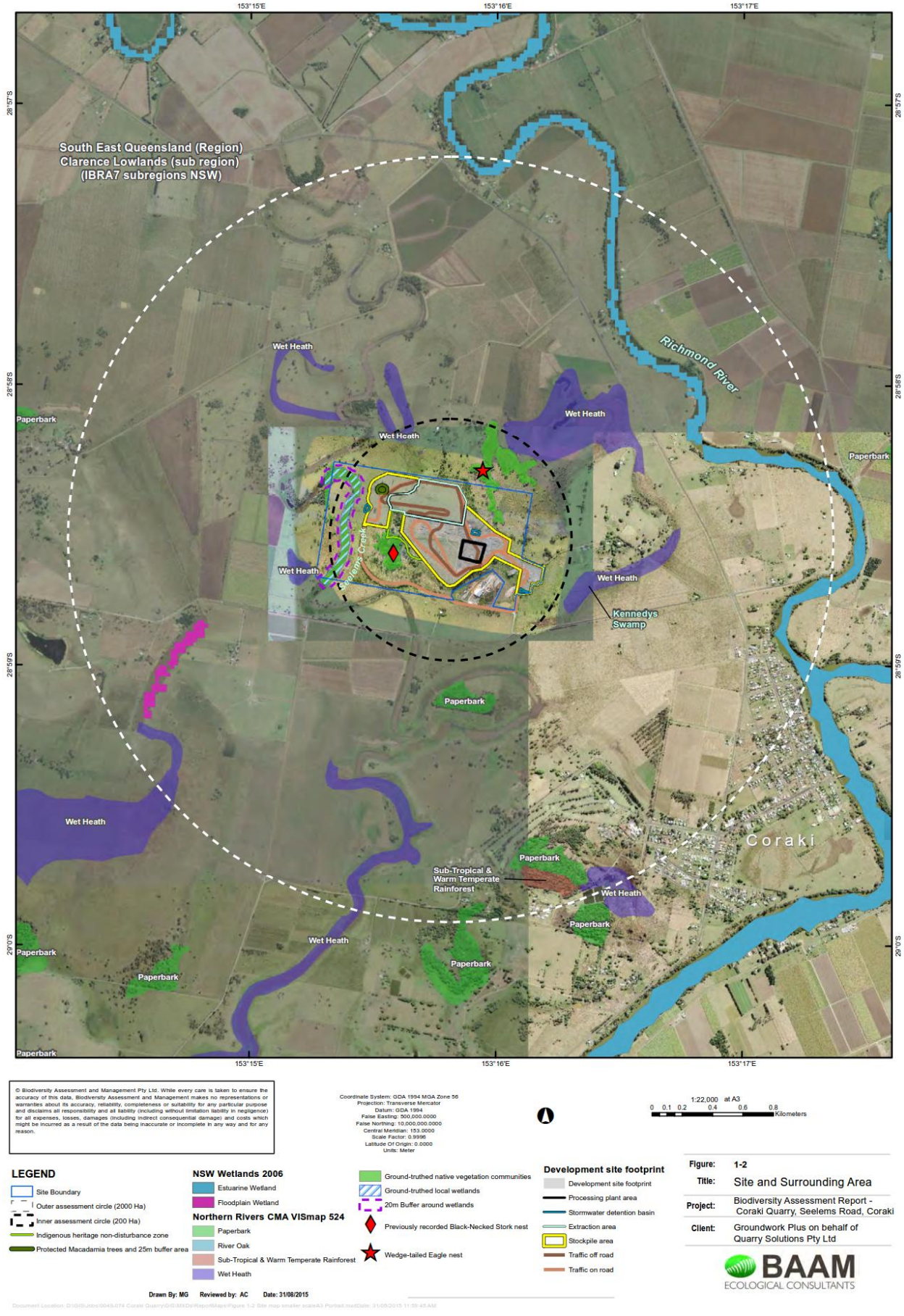
7.4.1 Background

Quarry Solutions Pty Ltd has commissioned the preparation of a development application for an Extractive Industry at Seelems Road (via Petersons Quarry Road), Coraki in New South Wales on land properly described as Lot 401 on DP633427, Lot 402 on DP802985, Lot 403 on DP802985, Lot 408 on DP1166287, Lot A on DP397946, Lot A on DP389418, Lot 3 on DP701197, Lot 2 on DP954593, Lot 1 on DP954592 and Lot 1 on DP310757. A Site Map and Location Map are provided as Figures 23 and 24, respectively.

As the project is considered a State Significant Development, the proponent must prepare an Environmental Impact Statement (EIS) as part of an application under the NSW *Environmental Planning and Assessment Act 1979*. Before preparing an EIS, proponents must also apply to the Secretary of the Department of Planning and Environment for the Secretary's Environmental Assessment Requirements (SEARs), which set out matters to be addressed in the EIS.

Figure 23 Site map showing biodiversity values

Figure 24 Biodiversity values of the surrounding area



Under the NSW Biodiversity Offsets Policy for Major Projects, the SEARs typically require a proponent to apply the Framework for Biodiversity Assessment (FBA) to assess impacts on biodiversity. Stages 1 and 2 of the FBA require the preparation of a Biodiversity Assessment Report (BAR) describing the biodiversity values present on the development site and the impact of the project on these values. A Biodiversity Offset Strategy is then prepared that outlines how the proponent intends to offset the impacts of the project.

The SEARs received for the project identified biodiversity as one of the key issues to be addressed, having regard to the requirements of the NSW Office of Environment and Heritage (OEH) and Primary Industries NSW (DPI) specified in the SEARs. In particular, OEH's requirements included addressing and documenting biodiversity impacts in accordance with the FBA, unless otherwise agreed by OEH.

A preliminary assessment of ecological values on the site, including a brief desktop review and field investigation, was completed by BAAM on 22 April 2015, prior to the release of the SEARs. The primary issues derived from the desktop review were the potential presence of Hairy-joint Grass (*Arthraxon hispidus*), currently listed as Vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), within the area of the proposed development footprint, including/particularly within cleared areas, and the Lowland Rainforests of Subtropical Australia Threatened Ecological Community (Critically Endangered – EPBC Act) in association with drainage lines on the study area. The preliminary site investigation revealed neither of these occurs within the area of the proposed development footprint, and the site is largely devoid of native vegetation and had been used for grazing livestock, particularly within the area nominated for the main quarry pit. However, it was considered prudent for quarry designs to establish sufficient buffers to nearby wetlands and native vegetation, pending the results of further investigations.

It was concluded the site of the area of the proposed development footprint was unlikely to hold any notable value for flora or fauna species of significance and, therefore, a requirement for biodiversity offsets under the BioBanking process was also unlikely. Consequently, following a review of the results of the preliminary assessment, correspondence received from OEH confirmed that, due to the degraded state of the site, OEH would not require the FBA to be used to assess the biodiversity values and associated impacts, subject to the results of further investigations (refer Attachment 5, Appendix 2).

Correspondence received from DPI also confirmed that, given the location of the site in the landscape and the fact that no dredging, works within a waterway, impacts or damage to marine vegetation, placement of spoil in waterways, activities that block fish passage or impacts to fishing and aquaculture were anticipated, there are no fisheries issues and no aspects of the works trigger the need for any approvals under the NSW Fisheries Management Act 1994, provided the nearby wetland was not impacted by the proposal (refer Attachment 5, Appendix 2).

The SEARs also state it should be established whether the project requires a separate approval under the EPBC Act, while Richmond Valley Council also identified biodiversity values of local significance requiring assessment as part of the SEARs.

7.4.2 Methodology

The biodiversity values of the study area were assessed through a desktop review of available information together with a field survey conducted by two ecologists over one day.

The desktop review involved an inspection of publicly available databases and mapping, and other information, including:

- The Commonwealth Department of the Environment (DoE) EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred on the site);
- The NSW BioNet Atlas of NSW Wildlife and associated species profiles (10 km x 10 km search area centred in the site);
- Publically available spatial data for the mapping of IBRA Bioregions, Mitchell Landscapes, wetlands and waterways, and native vegetation.
- Richmond Valley Council environmental planning layers and Koala (*Phascolarctos cinereus*) habitat mapping; and

- Aerial photography and background information on the project and the results of previous studies undertaken in support of proposed extensions to the adjacent Peterson's Quarry, as provided by the applicant or otherwise publically available.

The field survey was conducted on 2 July 2015 by Adrian Caneris (Principal Wildlife Expert) and David Fell (Principal Botanist), following a preliminary site investigation undertaken by Dr Lindsay Popple (Senior Ecologist) on 22 April 2015 (Appendix 1). Data from the Bureau of Meteorology indicates conditions were mild (maximum of 240C) with minimal rainfall (2.2mm) during the preliminary site investigation, with moderate rainfall during the preceding month (138mm). Conditions during the survey on 2 July were cool-mild (maximum of 200C) and dry, with limited rainfall during the preceding month (37mm). All survey work was performed in accordance with BAAM's NSW Scientific Licence (SL100704) and Certificate of Accreditation as an Animal Research Establishment.

The survey primarily involved the assessment of all native vegetation, habitats and other landscape features on and adjacent to the proposed site development footprint (subject to access) for informing subsequent mapping and value assessments, and determining the need for any further assessment for threatened species. The field work focused on assessing vegetation and habitats within and directly adjacent to Lot 401 on DP633427, given proposed development within the other Lots included in the application are restricted to previously disturbed areas associated with Petersons Quarry.

The flora survey generally followed the methods outlined in the FBA, and included plot and transect surveys for the assessment of native vegetation. Targeted searches for threatened flora species were also undertaken across the site throughout the survey period. The location of survey locations is shown on Figure 3-1 of Attachment 5.

Given the small size of the site, all vegetation communities, habitats and detectable flora species were able to be assessed and accounted for during the survey. As the time of year for the survey (winter) is outside the most suitable time for detecting many of the threatened fauna species potentially occurring in the vicinity of the site, the fauna survey component focused on the availability and quality of habitats present, combined with active searching for fauna signs (e.g. Koala scratches and scats) and opportunistic species records.

The locations of any significant values were recorded by GPS for subsequent mapping purposes.

While it is acknowledged that the time of year and conditions during which the primary survey was undertaken (i.e. winter, with limited rainfall) may fall outside the ideal time of the year to survey for one or more target species, the likelihood of their occurrence is able to be assessed through integration of the following sources of information:

- Review of the published literature pertaining to the known distributions, habitat requirements and detectability of the species; and
- Onsite habitat assessment results and professional experience.
- The likelihood of occurrence assessment used the following four categories to determine the probability of conservation significant flora and fauna species occurring in the habitats available within the study area:
- Known to occur: the species was detected during field assessment, or is known from past surveys in the study area and is not now considered locally extinct.
- Likely to occur: a medium-high probability the species occurs in or regularly visits the study area because suitable habitat occurs, the study area is within the known distribution of the species, there are past records of the species in the vicinity of the study area, and the species is not considered locally extinct.
- Potential to occur: either: (a) there are no past records of the species in the vicinity of the study area but suitable habitat occurs and there is insufficient information on the distribution of the species (e.g. it is naturally rare and/or difficult to detect) to categorise the species as likely or unlikely to occur; or (b) there are past records of the species in the vicinity of the study area but habitat in the study area is marginal or spatially limited meaning that the species' presence on the study area would be transitory at best.
- Unlikely to occur: a very low probability that the species occurs in the study area because: (a) suitable habitat does not occur; or (b) the study area is outside the known distribution of the species; or (c) the species is considered locally extinct; or (d) there are no records of the species in the local region despite adequate survey effort; or (e) suitable habitat occurs, the study area is within the known distribution of the species and there are past records of the species in the vicinity of the study area but the species has not been observed despite sufficient

spatial and temporal survey effort for detecting the species. Based on the above, where the likelihood of a species' occurrence is inconclusive, the species is typically assessed as having potential to occur and is subsequently considered in the assessment of potential impacts. This includes species for which the time of year the survey is undertaken is generally not suitable for detection.

7.4.3 Existing environment

The study area occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion. The study area includes the following Mitchell Landscapes:

- Lamington Volcanic Slopes.
- Grafton-Whiporie Basin.
- Clarence-Richmond Alluvial Plains.

Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands, none of which are recognised as "important" wetlands. The wetlands in the study area would be considered local wetlands, with an applicable riparian corridor width of 20m. Wetlands known as Kennedy's Swamp occur to the east and north-east of the study area.

Native vegetation recorded during the field survey was generally restricted to the western portions of Lot 401 on DP633427 and Lot 403 on DP802985, and along the boundary of Lots 402 and Lot 403 on DP802985, as well as to the north-east of the study area. Further details on this ground-truthed vegetation are provided in Section 3.2 of Attachment 5.

Native vegetation currently recognised in the broader area includes that described as "wet heath" in patches to the north-west, north-east, east and south-west of the study area, while a patch of "paperbark" is mapped to the south.

No state or regionally significant biodiversity links are recognised as occurring within the study area. Vegetation associated with Seelems Creek may act as a local biodiversity link.

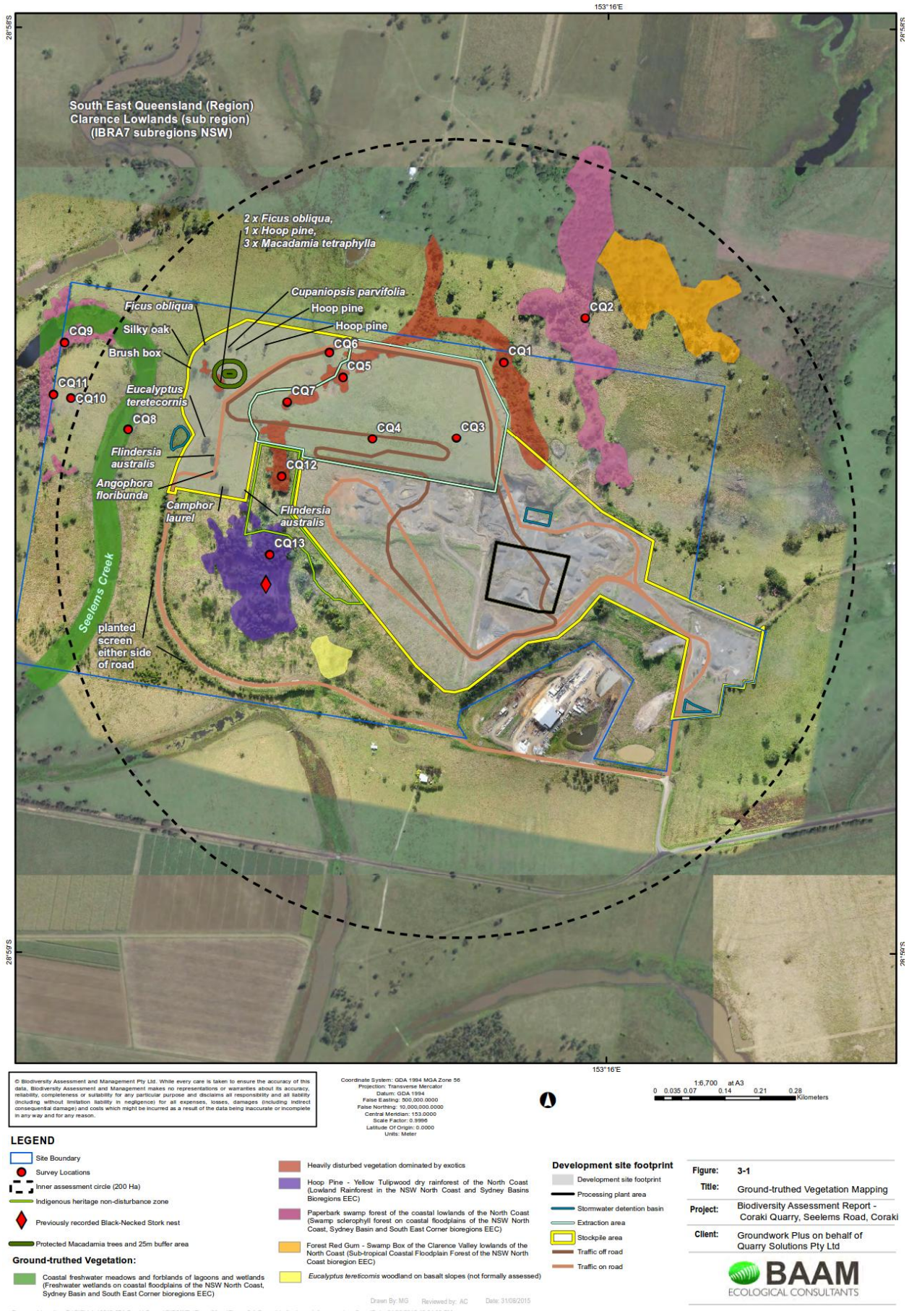
No recognised native vegetation types or associated biodiversity links are proposed to be directly impacted by the project (refer to Section 4.0 of Attachment 5). As such, an assessment of current and future landscape values for the purposes of determining a change in landscape value is not considered necessary.

The field survey identified four native vegetation types within or in close proximity to the study area, all of which are recognised as Endangered Ecological Communities (EECs):

- NR179: Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast – a component of the "Dry Rainforests" vegetation class and "Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions" EEC (survey site CQ13 on Figure 3-1).
- NR161: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast – a component of the "Coastal Valley Grassy Woodlands" vegetation class and "Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion" EEC (survey site CQ2).
- NR217: Paperbark swamp forest of the coastal lowlands of the North Coast – a component of the "Coastal Swamp Forests" vegetation class and "Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC (survey sites CQ9 and CQ11).
- NR150: Coastal freshwater meadows and forblands of lagoons and wetlands – a component of the "Coastal Freshwater Lagoons" vegetation class and "Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC (survey site CQ8).

As shown on Figure 25, these native vegetation communities all occur outside of the proposed development footprint.

Figure 25 Ground truthed vegetation mapping



7.4.4 Threatened species – flora

A search of the NSW BioNet Atlas of NSW Wildlife (10 km x 10 km search area centred in the site) returned a total of five flora species listed as threatened under the NSW *Threatened Species Conservation Act 1995* (TSC Act), including three species listed as Endangered and two species listed as Vulnerable (Appendix 5 of Attachment 5). Four of these species are also currently listed as threatened under the EPBC Act (two Endangered, two Vulnerable).

The Commonwealth EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred on the site) returned an additional eight threatened flora species, including three listed as Endangered and five species listed as Vulnerable (Appendix 5 of Attachment 5). All of these species are also currently listed as threatened under the TSC Act (three Endangered, five Vulnerable).

Table 3.1 of Attachment 5 presents an assessment of potential occurrence of threatened flora species from the database searches, based on a review of species profiles and the habitat types present on the study area. Some of these species are assessed as having the potential to occur, including within disturbed habitats on basalt hills and on adjoining properties. However, none were detected despite targeted searching within all habitat types (including comprehensive searches within the proposed development footprint), and despite the majority of species being detectable throughout the year. Hence the potential for significant impacts on these species is considered low. The same applies to Hairy-joint Grass *Arthraxon hispidus*, which may not have been detectable during the 2 July (winter) survey, but was specifically targeted during the 22 April (autumn) survey during appropriate conditions.

Furthermore, the current extent of impacts from grazing and weed invasion throughout the native habitats within the study area is such that some species are considered unlikely to occur regardless of search effort. This includes all remaining target species that may not have been detectable during either survey.

Four specimens of a threatened species not returned by the database searches were recorded during the field survey, namely *Macadamia tetraphylla* (Rough-shelled Bush Nut), currently listed as Vulnerable under both the TSC Act and EPBC Act. The specimens occur together within the centre of Lot 401 on DP633427, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the study area, as shown on Figure 25 above. The geographic coordinates and a description of each specimen are provided in Table 3.2 of Attachment 5. These plants are either relicts of a dry rainforest or forested wetland community that once occupied that part of the site, or they have propagated from seeds dispersed from nearby communities.

7.4.5 Threatened species – fauna

A search of the NSW BioNet Atlas of NSW Wildlife (10 km x 10 km search area centred in the site) returned a total of 11 fauna species listed as threatened under the TSC Act, including one species listed as Endangered and 10 species listed as Vulnerable (Appendix 5 of Attachment 5). Two of these species are also currently listed as Vulnerable under the EPBC Act.

The Commonwealth EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred in the site) returned an additional 33 fauna species listed as threatened under the EPBC Act, including 14 species listed as Endangered and 19 species listed as Vulnerable (Appendix 5 of Attachment 5). This includes a number of marine species for which the site and proposed activities should not be viewed as relevant, including 11 species of albatross, two species of giant-petrel, one species of marine fish and five species of marine turtle. These 19 species are not considered further in this report.

Forest Red Gums (*Eucalyptus tereticornis*) within the open forest habitat to the north-east of the study area showed scratches consistent with those of Koala (Vulnerable: TSC Act and EPBC Act). No evidence of Koala occurrence was found within the study area, despite targeted searches. Although it is possible Koalas may occasionally utilise food trees occurring within the open paddock and fringing the wetlands, these areas are of less value to the species than the habitats occurring off-site.

An assessment of Koala habitat in the context of Commonwealth and local statutes is provided in Sections 3.4.2 and 3.5.2 of Attachment 5, respectively.

No other threatened fauna species identified in the database searches were recorded during the field survey, although it is acknowledged that the time of year during which the survey was undertaken (winter) is outside the suitable time for detecting some of these species. Nonetheless, coverage of the site during the survey was such that all potential habitats were able to be assessed in sufficient detail to enable an informed assessment of potential occupancy for all species.

Table 3.3 of Attachment 5 presents the assessment of potential occurrence of threatened fauna species identified in the database searches. This assessment is based on a review of species profiles and the assessment of habitats during the field survey. Several threatened fauna species have the potential to occur within the habitats present within the study area, at least as transient visitors during foraging, particularly birds and bats.

Black-necked Stork (Endangered: TSC) and Comb-crested Jacana (*Irediparra gallinacea*) (Vulnerable: TSC Act) are known to occur on the site from previous records, and the study area continues to provide suitable habitat for these species. In particular, the dry rainforest community on the boundary of Lots 402 and Lot 403 on DP802985 provides known breeding habitat for Black-necked Stork while the wetlands associated with Seelems Creek provide known habitat for both Black-necked Stork and Comb-crested Jacana, as well as potential habitat for a number of other species.

As noted in Section 2.2 of Attachment 5, species known, considered likely or considered to have the potential to occur are subsequently considered in the assessment of potential impacts. This includes species for which the time of year the survey is undertaken is generally not suitable for detection.

Even so, the degraded habitats present within the area of the proposed development footprint provide very limited habitat value for threatened fauna species. Hence the potential for significant impacts on these known, likely or potentially occurring species is considered low, and many species are considered unlikely to occur regardless of search effort. This includes all remaining target species that may not have been detectable during the survey.

A list of all other fauna species recorded during the survey is provided in Appendix 7 of Attachment 5.

7.4.6 Matters of National Environmental Significance

Threatened Ecological Communities

The Commonwealth EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred in the site) identified one threatened ecological community (TEC) that may occur within the study area: 'Lowland Rainforest of Subtropical Australia' (Critically Endangered) (Appendix 5 of Attachment 5). The field survey found that one vegetation community potentially corresponding to this TEC occurs within the study area, that being the Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast vegetation type occurring on the boundary of Lots 402 and Lot 403 on DP802985.

As noted in the listing advice for the Lowland Rainforest of Subtropical Australia TEC, the listing focuses on protecting patches of this community that are "most functional, relatively natural…", "…and in relatively good condition" (TSSC, 2011). Accordingly, condition thresholds have been developed to establish whether a patch of vegetation retains sufficient conservation values to be considered a TEC.

An assessment of vegetation data obtained for the patch of Hoop Pine dominated dry rainforest community recorded during the field survey (Appendix 3 of Attachment 5) against these condition thresholds confirms the community present onsite fails one of the mandatory criteria relating to the high species richness that characterises good examples of the TEC – that is, patches need to contain at least 30 of the native woody species listed in an appendix to the listing advice, whereas the patch present on the study area contains less than 30 of these species.

Accordingly, none of the vegetation on the study area is recognised as a TEC and a referral to the Commonwealth in relation to impacts on TECs is not considered necessary at this time.

Threatened Species

The Commonwealth EPBC Online Protected Matters Search Tool and a search of the NSW BioNet Atlas of NSW Wildlife (10 km x 10 km search area centred in the site) (Appendix 5 of Attachment 5) indicate the potential presence of a number of EPBC Act listed threatened flora and fauna species for the study area.

Flora

None of the threatened flora species returned by the database searches were recorded during the field survey, despite targeted searching within all habitat types (including comprehensive searches within the proposed development footprint), and despite the majority of species being detectable throughout the year. Current impacts from grazing and weed invasion throughout the native habitats within the study area is also such that some of these species are considered unlikely to occur regardless of search effort or detectability. However, four specimens of a threatened species not returned by the database searches were recorded during the field survey: *Macadamia tetraphylla* (Rough-shelled Bush Nut). This species is currently listed as Vulnerable under both the TSC Act and EPBC Act.

The four recorded specimens occur together within the centre of Lot 401 on DP633427, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the study area, as shown on Figure 3-1 of Attachment 5. These specimens are either relicts of a dry rainforest or forested wetland community that once occupied that part of the site, or they have propagated from seeds dispersed from nearby communities.

Recognised threats to *Macadamia tetraphylla* that are currently present on the site include invasion of habitat by weeds and grazing and trampling (of seedlings) by domestic stock. Recognised activities to assist this species focus on the protection and expansion of rainforests and other native habitats.

An assessment of potential impacts on this species is provided in Section 4.0 of Attachment 5.

Fauna

None of the threatened fauna species returned by the database searches were recorded during the field survey, although it is acknowledged that the time of year during which the survey was undertaken (winter) is outside the suitable time for detecting many of these species. Nonetheless, coverage of the site during the survey was such that all potential habitats were able to be assessed in sufficient detail to enable an informed assessment of potential occupancy for all species returned by the database searches.

Table 3.3 of Attachment 5 presents the assessment of potential occurrence of threatened fauna species returned by the database searches, based on a review of species profiles and the assessment of habitats undertaken during the field survey. This excludes a number of marine species for which the site and proposed activities should not be viewed as relevant.

Forest Red Gums within the open forest habitat to the north-east of the site showed scratches consistent with those of Koala (Vulnerable: TSC Act and EPBC Act) and it is possible this species may also occasionally utilise food trees occurring within the open paddock and fringing the wetlands. The assessment of potential occurrence also indicates the study area provides potential habitat for Grey-headed Flying-fox (Vulnerable), Australasian Bittern (Vulnerable) and Painted Snipe (Vulnerable).

Koala

Known Koala habitat occurs in close proximity to the study area in the form of Forest Red Gum woodland, and Koalas may also visit eucalypts occurring as scattered paddock trees and on the wetland fringes. The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala are summarised in Table 3.4 of Attachment 5. The total habitat score from this assessment is 4; as this total score is <5, the habitats onsite are not considered to represent critical habitat and the referral guidelines indicate a referral to the Commonwealth in relation to impacts on this species is not considered necessary at this time.

Grey-headed Flying-fox

Grey-headed Flying-fox may visit the forested habitats on site in response to seasonal flowering events. However, such foraging habitat is widespread in the local region, and this species travels widely to exploit seasonal flowering trees, so any loss of habitat within the study area will not have an adverse effect on the long-term survival of the species

in the locality. Furthermore, no roosting camp occurs in the study area, so the proposed action is unlikely to have an adverse effect on the life cycle of the species. Accordingly, a referral to the Commonwealth in relation to impacts on this species is not considered necessary.

Australasian Bittern and Painted Snipe
It is possible that these species may occasionally utilise the thicker vegetated areas within the wetland habitats on the study area and adjacent properties. However, there are no confirmed records of either species in the vicinity and similar foraging habitat is widespread in the local region. Accordingly, a referral to the Commonwealth in relation to impacts on these species is not considered necessary at this time.

Other Threatened Species
There is also a low potential for Regent Honeyeater, Coxen's Fig-Parrot, Red Goshawk and Swift Parrot to visit the study area during foraging/hunting. However, there are no confirmed records of any of these species in the vicinity and the habitats present within the study area are not particularly valuable for these species, given their degraded condition, small patch size and isolation. Accordingly, a referral to the Commonwealth in relation to impacts on these species is not considered necessary at this time.

7.4.7 Matters of Local Environmental Significance

Richmond Valley Council's Local Environmental Plan (LEP) mapping (RVC 2015a,b) indicates a recognised wetland occurs in the western portion of the study area, consistent with the freshwater wetland community identified during the field survey (refer Figure 1-1 and Section 3.2.1 of Attachment 5). The LEP mapping also identifies the western part of the study area as an important area for biodiversity, which appears to be associated with the wetland.

The LEP mapping identifies important areas for biodiversity in the centre and to the north-east of the study area. These areas were identified as comprising native vegetation communities during the field survey, other than the smallest patch mapped in the centre of the study area that was found to be dominated by exotics (refer Figure 3-1 and Section 3.2 of Attachment 5). These areas are also identified on the LEP mapping as wetlands. No wetland vegetation was recorded within these areas during the field survey, although they could become seasonally inundated, thereby providing potential habitat for frogs and water birds.

The results of the field survey generally support the LEP mapping of relative biodiversity importance in that the far western and central parts of the study area and areas to the north-east contain native vegetation and associated habitat values for native fauna, including species of conservation significance.

Richmond Valley Council's Koala Habitat Atlas mapping indicates Class B and C secondary Koala habitat occurs to the north-east and in the far west of the study area, respectively.

The Richmond Valley Koala Habitat Atlas defines Class B secondary Koala habitat as areas of forest or woodland where primary Koala food tree species comprise less than 30% of the overstorey trees, or together with secondary food tree species comprise at least 30% (but less than 50%) of the overstorey trees, or where secondary food tree species alone comprise at least 30% (but less than 50%) of the overstorey trees (primary Koala food tree species absent). This habitat class is capable of supporting medium to low-density Koala populations. Class C secondary Koala habitat is defined as areas of forest or woodland where Koala habitat is comprised of secondary and supplementary food tree species (primary Koala food tree species absent), where secondary food tree species comprise less than 30% of the overstorey trees. This habitat class is capable of supporting low-density Koala populations.

The results of the field survey generally support the Koala Habitat Atlas mapping in that the vegetation in the north-east offers the highest value Koala habitat, with less valuable potential habitat occurring on the fringes of the wetlands.

It is understood that a Black-necked Stork once nested in a Hoop Pine located within the centre of the dry rainforest community occurring within the centre of the study area (refer Figure 3-1 of Attachment 5). The current field survey found no active nests in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore Black-necked Stork is unlikely to currently utilise these trees for nesting. However, this vegetation continues to provide potential breeding resources.

7.4.8 Impact assessment

During the construction phase, clearing and/or grubbing activities will be required for the establishment of all key infrastructure components outside of the previously disturbed areas associated with Petersons Quarry. Clearing will also occur progressively during quarry operation for the extension of the pit and stockpile areas.

Clearing of vegetation reduces the total amount of habitat and populations of flora and fauna, and has the potential to result in isolation of habitats and populations, changes to remaining vegetation that cause the loss of food, breeding and shelter resources for fauna, and exposure to introduced species that are either competitors or predators.

Removal of vegetation will also result in direct loss of individual plants, including large trees that may provide nesting resources to fauna, and can result in the mortality of fauna present at the time of clearing.

Secondary impacts can affect peripheral vegetation through:

- soil disturbance/exposure and altered water flow patterns, and subsequent erosion and sedimentation, which may expose tree roots, smother vegetation, and potentially alter the physical form, chemical processes and ecological health of downstream aquatic and riparian habitats;
- increased desiccation, light penetration, wind-throw, herbivory, weed invasion, nest predation, and parasitism for adjacent flora and fauna. In particular, introduced weeds can change vegetation community composition and in some cases increase the intensity of fire, leading to further community degradation;
- salinisation of areas downslope, depending on the clearing extent and nature of the associated landform and geology/soils; and
- clearing, earthworks, vehicle movements, wind and blasting within the project area causing increased dust which will potentially impact on nearby vegetation. Excessive dust has been known to reduce photosynthesis rates and inhibit plant growth, and pollutants in dust can impede plant growth.

Clearing can also create barriers to fauna movement through habitat fragmentation, affecting reproductive cycles and facilitating the incursion of pest species and aggressive, native “edge” species deeper into woodlands and open forests.

In addition to clearing and the associated secondary (or indirect) impacts, the construction and operation phases have the potential to result in on-going disturbance to surrounding habitats. Noise, dust and vibration affect habitat adjacent to active areas due to ground disturbance, the operation and movement of machinery traffic along haul roads, exposed stockpiles and blasting.

Noise, including background noise, generated by human activities can potentially affect behaviour and persistence of species and communities by, for example, masking of alarm and mating calls, location and motion of resources, obstructions or potential harms; in short, noise pollution affects the sending and reception of behavioural and social signals in faunal communities.

Another potential impact associated with fauna, particularly reptiles and small mammals, is becoming trapped in any trenches or other excavations that remain open for any period of time. This may lead to mortality either by exposure, starvation, thirst or predation by other species. Open pipes may also attract fauna, particularly micro-bats and reptiles, which may then be injured or killed when the pipes are transported and utilised.

An increase in heavy and light vehicle traffic during both the construction and operation phases could contribute to increased animal/vehicle collisions on local roads. Species particularly susceptible to traffic collisions include larger and slow-moving snakes, monitors and other large lizards, macropods and frogs (during wet periods).

Vehicles also have the potential to introduce and/or spread weed species and plant pathogens in disturbed soil, while general waste and land disturbance has the potential to attract highly competitive and/or predatory exotic fauna species. Increased human presence has the potential to increase the frequency of accidental fires within vegetated areas, adversely affecting habitat structure and therefore habitat value for a range of significant species.

Fuels and chemical spills from storage areas and oils from heavy machinery can enter the environment, affecting habitats where the spill occurs, and potentially causing more widespread impact if contaminants reach waterways.

The operation of the quarry also has the potential to disrupt natural ecological processes within the local area through:

- limiting the natural movement and dispersal of ground-dwelling and flightless fauna (i.e. for breeding and foraging purposes), which are unable to traverse the quarried landscape;
- altering the local surface water environment due to large-scale landform modification, and subsequent potential impacts on downstream terrestrial ecosystems, particularly wetlands and riparian vegetation, and other sensitive vegetation communities and dependent fauna. This includes alterations to base flows, as well as to the frequency and extent of flooding; and
- creating long-term edge effects along the borders of the active area and adjacent habitat.

It is understood the hours of operation will be restricted to 6am to 7pm Monday to Saturday, with no night works proposed. As such, there will be no impacts as a result of artificial lighting, which could otherwise affect behaviour of both nocturnal and diurnal fauna.

7.4.9 Impact management

The overarching principle of relevant State and Commonwealth environmental protection policies in terms of impact management is to avoid impacts as much as possible in the first instance, following which mitigation measures should be used to reduce unavoidable impacts to acceptable/insignificant levels. Where impacts remain at unacceptable/significant levels post-mitigation, only then should compensatory measures (e.g. offsets) be employed as a last resort.

The following sections outline the proposed measures for avoidance, mitigation and compensation to address potential impacts on terrestrial ecological values as a result of the proposed development.

The most effective means of impact avoidance is through appropriate development footprint design. As shown, the proposed site development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation recognised as native vegetation communities that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. No EECs, wetlands or important habitat for threatened flora and fauna species (as identified during the site survey and recognised on local government mapping) will be directly impacted. Buffers will be retained between the recognised vegetation communities (and associated EECs and wetlands) and the edge of the proposed site disturbance footprint to further prevent secondary impacts.

It is imperative that the positive ecological outcomes of this design are respected through strict controls on the clearing of vegetation, access and storage of site personnel, vehicles, machinery, materials and excavated soil, and other construction and activities throughout the life of the Project. Of particular importance will be the identification and enforcement of no-go areas and regular monitoring of the condition of retained vegetation and habitat for unauthorised clearing and secondary impacts.

Original development plans involved the clearing of patches of isolated vegetation within the centre of Lot 401 on DP633427 area as part of a designated stockpiling area. The field survey undertaken as part of the current assessment recorded four specimens of Macadamia tetraphylla (currently listed as Vulnerable under the TSC Act and EPBC Act) within one of these patches. In response to the survey results, the original footprint was redesigned to avoid the clearing of these specimens. Taking into account site constraints and the necessary size of the stockpiling area to meet operational requirements, the current, revised footprint incorporates the retention of these specimens and a 25m buffer.

Additional management measures to mitigate residual impacts on these plants are discussed in the following section.

7.4.10 Impact mitigation

In general, the area proposed to be disturbed for the project is of relatively low habitat value in the context of the surrounding area and particularly in comparison with the adjacent patches of native vegetation. The overall value of the proposed disturbance area (as habitat) has been reduced because of historical clearing and grazing practices, which have significantly reduced areas of cover and facilitated the dominance of exotic vegetation.

Nonetheless, the area within the proposed site development footprint (outside of currently disturbed areas associated with Petersons Quarry) still retains some limited habitat value and provides resources for some terrestrial fauna species. Furthermore, the mosaic of pasture, remnant vegetation and regrowth across the entire site provides resources for species that are adapted to respond to a range of conditions. For example, mobile species adapted to foraging in open areas, but with specific or preferred requirements, will use such areas (e.g. Cattle Egrets). Habitat osaics also increase the resources available to other fauna species. For example, microbats may roost in woodland and forage in open areas, as do larger marsupials (e.g. kangaroos and wallabies). There is also the potential for direct and indirect impacts on adjacent habitats and associated flora and fauna species, without adequate controls. Consequently, implementation of the following mitigation measures is recommended to reduce impacts on native flora and fauna to levels that will not cause significant or permanent harm:

- Restrict disturbance and access to areas absolutely necessary for the construction and the operation of the Project. Clearly cordon off all adjacent vegetation and buffer extents that are not to be disturbed from clearing activities, creating 'no go zones' for vehicles, materials, machinery, workers, excavated soil or fallen timber.
- Implement strict controls on construction and operational/maintenance activities that encroach into buffer areas around EECs, wetlands and known populations/habitats of significant species.
- Implement measures to avoid the spill of earth and rock downslope of the quarry footprint into areas of retained vegetation.
- Design and install temporary erosion control measures to avoid impacts on retained vegetation downslope of the quarry footprint.
- Leave ground layer vegetation (grasses and herbs) in situ wherever possible to assist soil stability. Mulching of heavily disturbed areas can assist in reducing soil erosion. Where necessary, temporary interception devices such as hay bales or geotextile fabric fencing can be employed to slow stormwater and intercept sediment.
- Non-millable vegetation can be mulched and used in rehabilitation or soil stabilisation works, provided no weeds are incorporated into the mulch.
- Consider the installation of nest boxes in areas where hollow-bearing trees must be removed and relocate large fallen logs and boulder piles to adjacent habitat to increase sheltering opportunities for displaced animals where it is not feasible to avoid such features during clearing.
- Ensure a fauna spotter/catcher is present during clearing and site preparation works to:
  - Check habitat (vegetation, logs, rock outcrops) for fauna and breeding sites,
  - Check any stored materials, including stockpiled timber, prior to removal,
  - Check temporary excavations for trapped fauna, and
  - Ensure appropriate treatment of injured/orphaned animals through liaison with local Wildlife Carers.
- Establish 'go slow zones' (40km/hr) for vehicles and machinery where non-gazetted roads or tracks are located adjacent to patches of native vegetation communities.
- Limit construction and operational work to daylight hours as far as practicable, and any lighting within outdoor areas should comply with relevant Australian Standards and be of low spillage, with no or limited upward spillage.
- Minimise vehicle and machinery access and subsequent soil compaction and weed transfer risk within and adjacent to retained vegetation.
- Undertake regular monitoring of the health and condition of retained vegetation and habitat, and the health of significant plant specimens.
- Undertake regular monitoring of road kills.
- Educate the workforce on the location of significant/sensitive communities and species and potential impacts from unauthorised activities.
- Develop and implement an Environmental Management Plan (EMP) that includes the following components to reduce secondary impacts on terrestrial flora, fauna and ecosystems:
  - Threatened species management,
  - Noise and dust suppression,

- Weed management,
- Management of environmental flows, runoff quality, erosion and sediment,
- Fuel, chemical spill and waste management, and
- Waste management.

Mitigation strategies relevant to the components of the EMP are outlined below in more detail for inclusion in the EMP. Management of erosion and sedimentation, soil and water contamination, environmental flows, noise, dust, vibration and chemical and oil spill management are standard components of Environmental Management Plans and are addressed within other specialist reports for the project.

The EMP will also address rehabilitation of the site post-operation. It is understood such rehabilitation will be limited to that necessary to return the site to a safe, stable, non-polluting state, suitable for reinstatement of previous land use (i.e. rural – cattle grazing).

7.4.11 Threatened species management

Macadamia tetraphylla

As noted, original development plans have been modified to allow the retention of four specimens of *Macadamia tetraphylla* together with a 25m buffer to be established and maintained around the plants. This far exceeds the minimum tree protection zone recommended within AS 4970-2009 "Protection of trees on development sites", which specifies a buffer radius equivalent to 12 times the stem diameter at breast height to minimise direct impacts to tree canopies and root zones. A larger (25m) buffer is appropriate for this site, given the threatened status of the plants and the scale of the adjacent development and associated, potential impacts from dust and soil compaction.

The locations of the plants and the 25m buffer will be clearly marked to facilitate onsite recognition, and will be recorded in all relevant quarry documentation for future reference. The 25m buffer will also be managed, such that existing weed infestations will be removed from within the buffer area. In-fill planting and edge-seal planting of native species ill also be undertaken to minimise the effect of further weed intrusion. The retention of a 25m buffer enhanced and maintained in this way is expected to improve existing habitat condition such that the plants' chances of survival are at least equivalent to their chances of survival if the development was not to occur.

Collection and storage of seeds from the existing plants is also recommended as insurance against potential mortality due to quarrying operations.

Regular monitoring of the existing plants and habitat within the surrounding buffer is also recommended, intended at detecting major changes to plant health and habitat conditions for informing adaptive management strategies. The monitoring is also intended to record detectable alterations to hydrology and water quality caused by the proposed stockpile area. It is anticipated that these factors will be managed by installing a physical barrier to minimise build-up of sedimentation, nutrients and weed propagules into the buffer.

A more detailed account of the proposed management actions for this species is provided in Table 4.1 of Attachment 5.

Black-necked Stork

Although previous studies indicate a Black-necked Stork once nested in a Hoop Pine located within the centre of the dry rainforest community occurring in the centre of the study area, targeted searches undertaken as part of the current field survey found no active nests in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore, Black-necked Stork does not currently utilise these trees for nesting. However, this vegetation continues to provide potential breeding resources, and there is a small possibility this species may utilise this habitat for nesting in the future.

Accordingly, it is recommended a fauna spotter/catcher is engaged to regularly (i.e. fortnightly) inspect the Hoop Pine dry rainforest community for signs of nesting throughout the construction phase of the project where this coincides with the breeding season for Black-necked Stork (May to January, inclusive). If any nesting activity is identified, a species management plan is to be developed and implemented that ensures any impacts to this species are not significant.

Weed Management

The proliferation of weed species in the landscape can have a serious effect on biodiversity values and ecosystem function. Pest plants may be controlled by:

- Limiting the introduction of weeds and weed propagules into the area of interest,
- Rapidly controlling any weeds that become established on the site,
- Regular monitoring of the area of interest, and
- Preparing a control/eradication plan with follow up action when and where needed.

The following actions should be taken during the life of the Project to reduce the possibility of weeds (or their propagules) entering the site:

- Regularly survey disturbance areas and haul/access roads, and identify and remove any new infestations of invasive weeds encountered. Treatment needs to take place in accordance with local and regional Pest Management Plans and State government recommendations.
- Ensure onsite personnel undertake appropriate training in vehicle hygiene and weed awareness and identification.
- Prepare a car park (preferably gravelled) to house all vehicles entering the site offices. The car park would be regularly checked for any weeds and treated.
- Prepare wash down areas and/or utilise Council approved wash down facilities for any machinery or vehicles entering the Project area that have been working outside of the local area.
- Obtain pest free certification for any soil, fill, mulch, etc entering the site.
- Appoint a person responsible for regularly monitoring for potential pest occurrences (and treatment if required) of equipment, vehicles, machinery and materials (including soil, mulch, fill) entering the site.
- Maximise the diversity and cover of native species when revegetating disturbed areas.

7.4.12 Residual impacts

The Project is not expected to result in the direct loss of any significant biodiversity values and, once the proposed mitigation measures are implemented, the remaining impacts of the Project on terrestrial ecological values are predicted to be minor or negligible, particularly in the context of existing site conditions and current impacts from previous land clearing, weed invasion and the presence of livestock. Hence offsets to compensate for residual impacts are not considered necessary.

7.4.13 Summary of MNES

Under the EPBC Act an action would require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance (MNES). MNES relevant to terrestrial ecology have been addressed throughout this report as part of the existing environment and impact assessment process, and it is concluded that there are no such MNES for which proposed measures of avoidance and mitigation are unable to reduce impacts to insignificant levels. In particular:

- Original development plans have been modified to allow the retention of the four specimens of *Macadamia tetraphylla* recorded within the study area, with a 25 m buffer established and maintained around the plants. This development design, along with further management actions proposed to avoid and mitigate impacts to these plants, suggests any impacts are highly unlikely to be significant.
- Although Koala habitat occurs in close proximity to the study area, and Koalas may also occur occasionally within the study area, consideration of the results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala indicates a referral to the Commonwealth in relation to impacts on this species is not necessary at this time.
- A number of listed Migratory species are known or considered likely to utilise the study area for foraging and, potentially, breeding. However, the local region has not been identified as supporting an ecologically significant proportion of habitat for any of these species, which are all common and widely distributed, and are neither known to be declining nor at the limit of their range within the study area.
- The proposed site development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all

patches of vegetation that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. No wetlands or other important habitat for threatened flora and fauna species as identified during the site survey and recognised on local government mapping will be directly impacted. Buffers will also be retained between the recognised vegetation communities (and wetlands) and the edge of the proposed site disturbance footprint, to further prevent secondary impacts.

Overall, the findings of this assessment indicate that, provided the impact mitigation measures outlined in this report are successfully implemented, there are no predicted significant impacts on any species listed as threatened or migratory under the EPBC Act. Accordingly, a referral to the Commonwealth in relation to impacts on species listed under the EPBC Act is not considered necessary at this time.

7.4.14 Summary of MLES

Matters of local ecological significance have been addressed throughout this report as part of the existing environment and impact assessment process, and it is concluded that there are no such matters for which proposed measures of avoidance and mitigation are unable to reduce impacts to insignificant levels. In particular:

- The proposed site development footprint has been positioned such that no wetlands or other important habitat for threatened flora and fauna species as identified during the site survey and recognised on local government mapping will be directly impacted. Buffers will also be retained between the recognised vegetation communities (and wetlands) and the edge of the proposed site disturbance footprint, to further prevent secondary impacts.
- The current field survey found no active nests of Black-necked Stork in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore Black-necked Stork is unlikely to currently utilise these trees for nesting.

7.5 Noise

MWA Environmental undertook an assessment of potential noise impacts from the project (refer Attachment 6) which is presented below for ease of reference.

7.5.1 Purpose of report

MWA Environmental was commissioned by Quarry Solutions Pty Ltd to undertake a Noise and Dust Assessment for the proposed Coraki Quarry.

The assessment has been conducted as supporting documentation for the Environmental Impact Statement ("EIS") prepared by Groundwork Plus in accordance with the Secretary's Environmental Assessment Requirements ("SEARs") issued by the Secretary of the Department of Planning and Environment on 22 May 2015 and revised on 30 July 2015.

The NSW Environmental Protection Authority advised by email dated 22 June 2015 that no quantitative assessment of diesel emissions associated with the project will be required. As such, the scope of the air quality assessment has been limited to particulate emissions.

7.5.2 Site description

The subject site is located at Seelems Road, Coraki, New South Wales. The site is located approximately 2 kilometres to the north-west of Coraki Village. The subject site comprises the following properties:

Primary Resource Area

- Lot 401 on DP633427

Access Road via Easement

- Lot 403 on DP802985

Existing Petersons Quarry

- Lot 402 DP802985
- Lot 408 DP1166287
- Lot A DP397946
- Lot A DP389418
- Lot 3 DP701197
- Lot 2 DP954593
- Lot 1 DP954592
- Lot 1 DP310756

Access to the Pacific Highway from the quarry is via Seelems Road / Petersons Quarry Road, Lagoon Road, Casino-Coraki Road, Queen Elizabeth Drive and Coarki-Woodburn Road. The haulage route to the Pacific Highway is shown on Figure 26 Quarry Haulage Route and Receptor Locations.

7.5.3 Surrounding land uses

Surrounding land uses are shown on the aerial photograph included as Figure 3.

Surrounding land uses generally comprise rural allotments with scattered detached dwellings.

The nearest surrounding residential dwellings relative to the subject site boundaries are described as follows:

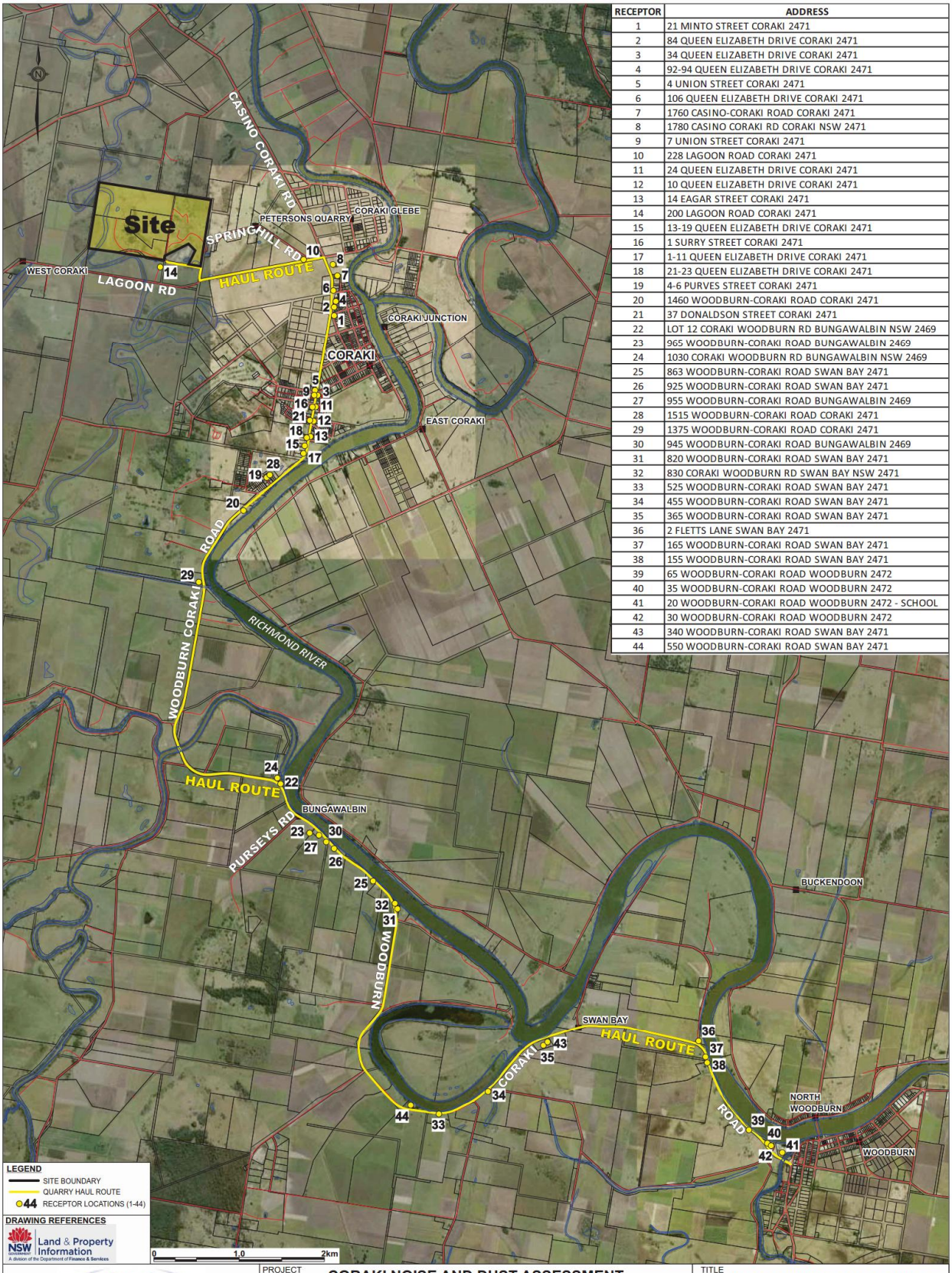
To the North:	Dwelling 310 metres to north, on Newmans Road
To the South:	Dwelling 85 metres to the south of the access road through Lot 403 on DP802985, 600m south of new resource area on Lot 401 on DP633427
To the West:	Dwelling 980 metres to the southwest of the access road through Lot 403 on DP802985
To the East:	Dwelling 285 metres to the east of the existing Petersons Quarry 825 metres east of the new resource area on Lot 401 on DP633427

Only one residential dwelling (to the north on Newmans Road) is located within 500 metres of the proposed new resource area on Lot 401 on DP633427.

Nine (9) residential dwellings surrounding the subject site have been nominated R1 to R9 on Figure 27 Surrounding residences for the purposes of this assessment.

Based upon aerial photography and site inspection, 44 residential dwellings were identified as being located within 100 metres of the haulage route between the quarry access and the Pacific Highway. These residences are shown on Figure 26 for the purposes of this assessment.

Figure 26 Quarry Haulage Route and Receptor Locations



RECEPTOR	ADDRESS
1	21 MINTO STREET CORAKI 2471
2	84 QUEEN ELIZABETH DRIVE CORAKI 2471
3	34 QUEEN ELIZABETH DRIVE CORAKI 2471
4	92-94 QUEEN ELIZABETH DRIVE CORAKI 2471
5	4 UNION STREET CORAKI 2471
6	106 QUEEN ELIZABETH DRIVE CORAKI 2471
7	1760 CASINO-CORAKI ROAD CORAKI 2471
8	1780 CASINO CORAKI RD CORAKI NSW 2471
9	7 UNION STREET CORAKI 2471
10	228 LAGOON ROAD CORAKI 2471
11	24 QUEEN ELIZABETH DRIVE CORAKI 2471
12	10 QUEEN ELIZABETH DRIVE CORAKI 2471
13	14 EAGAR STREET CORAKI 2471
14	200 LAGOON ROAD CORAKI 2471
15	13-19 QUEEN ELIZABETH DRIVE CORAKI 2471
16	1 SURRY STREET CORAKI 2471
17	1-11 QUEEN ELIZABETH DRIVE CORAKI 2471
18	21-23 QUEEN ELIZABETH DRIVE CORAKI 2471
19	4-6 PURVES STREET CORAKI 2471
20	1460 WOODBURN-CORAKI ROAD CORAKI 2471
21	37 DONALDSON STREET CORAKI 2471
22	LOT 12 CORAKI WOODBURN RD BUNGAWALBIN NSW 2469
23	965 WOODBURN-CORAKI ROAD BUNGAWALBIN 2469
24	1030 CORAKI WOODBURN RD BUNGAWALBIN NSW 2469
25	863 WOODBURN-CORAKI ROAD SWAN BAY 2471
26	925 WOODBURN-CORAKI ROAD SWAN BAY 2471
27	955 WOODBURN-CORAKI ROAD BUNGAWALBIN 2469
28	1515 WOODBURN-CORAKI ROAD CORAKI 2471
29	1375 WOODBURN-CORAKI ROAD CORAKI 2471
30	945 WOODBURN-CORAKI ROAD BUNGAWALBIN 2469
31	820 WOODBURN-CORAKI ROAD SWAN BAY 2471
32	830 CORAKI WOODBURN RD SWAN BAY NSW 2471
33	525 WOODBURN-CORAKI ROAD SWAN BAY 2471
34	455 WOODBURN-CORAKI ROAD SWAN BAY 2471
35	365 WOODBURN-CORAKI ROAD SWAN BAY 2471
36	2 FLETTS LANE SWAN BAY 2471
37	165 WOODBURN-CORAKI ROAD SWAN BAY 2471
38	155 WOODBURN-CORAKI ROAD SWAN BAY 2471
39	65 WOODBURN-CORAKI ROAD WOODBURN 2472
40	35 WOODBURN-CORAKI ROAD WOODBURN 2472
41	20 WOODBURN-CORAKI ROAD WOODBURN 2472 - SCHOOL
42	30 WOODBURN-CORAKI ROAD WOODBURN 2472
43	340 WOODBURN-CORAKI ROAD SWAN BAY 2471
44	550 WOODBURN-CORAKI ROAD SWAN BAY 2471

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PROJECT: CORAKI NOISE AND DUST ASSESSMENT
PETERSONS QUARRY EXPANSION
PETERSONS QUARRY ROAD CORAKI NSW

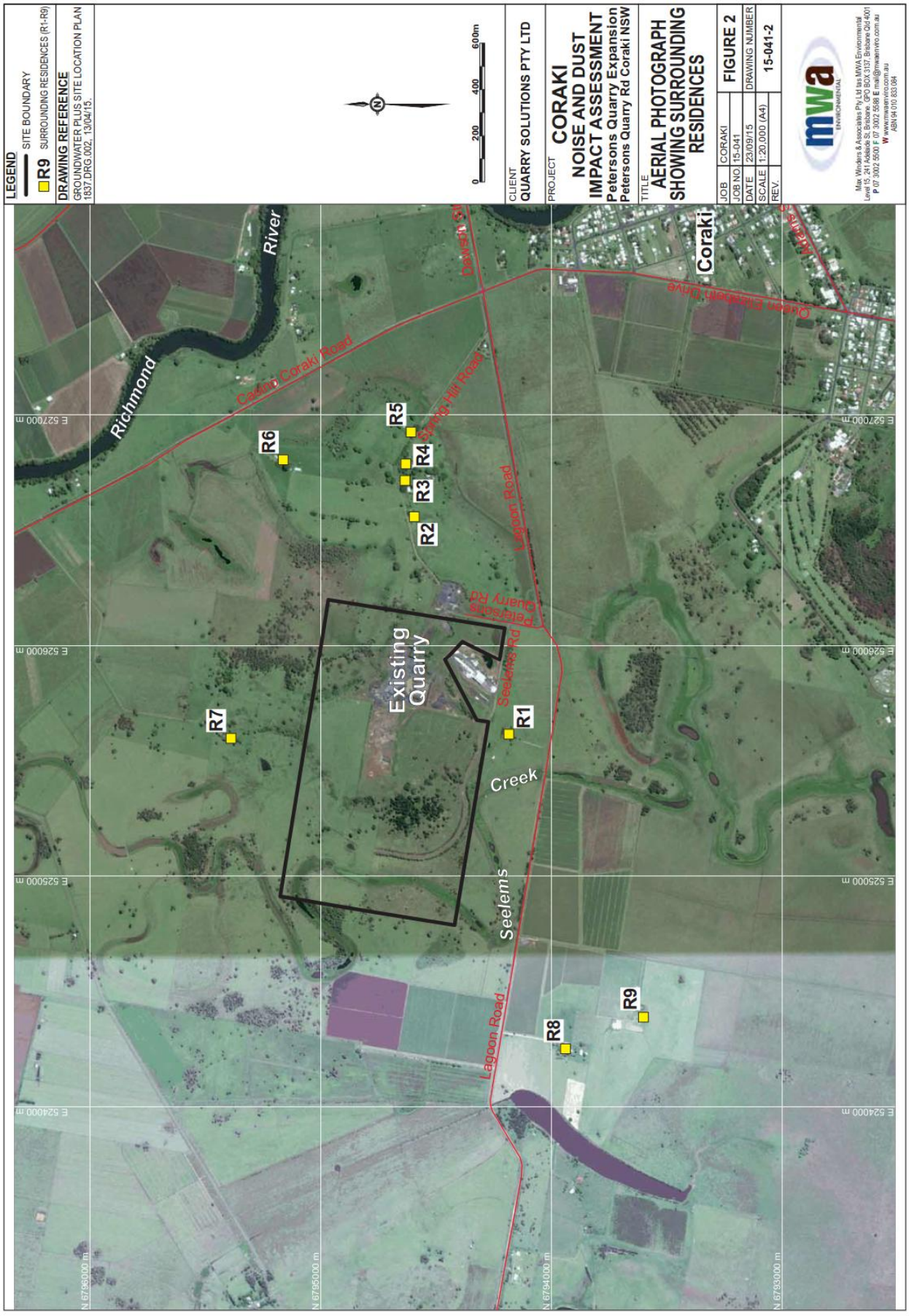
TITLE: QUARRY HAULAGE ROUTE AND RECEPTOR LOCATIONS

CLIENT: QUARRY SOLUTIONS PTY LTD

DRAWING REFERENCE: NSW GOVERNMENT LAND AND PROPERTY INFORMATION GIS

JOB	CORAKI	FIGURE 3
JOB NO.	15-041	
DATE	23/09/15	DRAWING NUMBER
SCALE	1:40,000 (A3)	15-041-3

Figure 27 Surrounding residences



7.5.4 Proposed development

Key elements of the Description of the Proposal contained in the Environmental Impact Statement by Groundwork Plus are reproduced as follows:

- Extraction will primarily occur within Lot 401 as an extension of the existing Peterson's Quarry pit. Stockpiling areas will be established on both Lot 401 and the Peterson's Quarry land to achieve stockpile capacity for up to 1,000,000 tonnes of materials as requested by the delivery partner for the Pacific Highway upgrade project.
- The existing site office, weighbridge and visitor car parking area of the Peterson's Quarry will be utilised for the project.
- The processing plant for the project will be established within the existing Peterson's Quarry pit to take advantage of the topographic screening available to that location which will assist in minimising potential risk of environmental nuisance from noise and dust emissions. Given the time limited, project specific nature of the project, the processing plant will consist of mobile crushing and screening plants rather than a permanent fixed plant.
- The Conceptual Quarry Development Plan Initial Extraction Stage illustrates how the initial extraction area will be developed from the existing Peterson's Quarry pit into Lot 401. The existing Peterson's Quarry pit has a floor of approximately RL18. This will be continued into Lot 401. Internal benches will be developed to enable progressive extraction to occur from east to west within lot 401. The internal northern face of the extraction area will be a single wall of approximately 20m in height to retain the receding rim of the hill, topographically screening the extraction operations both visually and acoustically from the surrounding land to the north, east and west. Stockpile areas will be established with earth works required as necessary to establish pads of suitable slope. Topsoil and overburden will be used to establish perimeter bunds where necessary to assist in visually screening the stockpile areas and also direct stormwater to the stormwater detention basins for treatment.
- The Conceptual Quarry Development Plan Final Extraction Stage illustrates the full extraction of the resource on Lot 401 to a floor of RL18m. Internal benches will adjoin the existing Peterson's Quarry to facilitate continued efficient development of that resource for the Richmond Valley Council into the future. The internal northern and eastern face of the extraction area will be retained as a single wall of approximately 20m in height. The internal western face of the extraction area will be approximately 3m in height to transition to the western stockpile area on Lot 401. A ramp between the extraction area and the western stockpile area on Lot 401 will be retained in the final land form to accommodate continued connection for any potential redevelopment of the land.

It is proposed to extract a maximum of 1,000,000 tonnes of hard rock material per annum. The expected operating life of the quarry is five (5) to seven (7) years subject to the duration of the upgrade works to the Pacific Motorway. As the proposed development will involve extracting and processing more than 30,000 tonnes of extractive materials per year, it will require an environment protection licence under the Protection of the Environment Operations Act 1997 (POEO Act).

Hours of operation and project duration

The proposed hours of operation are 6am to 7pm Monday to Saturday, 9am to 3pm Monday to Friday for blasting, and no work on Sundays or public holidays. Operation of the quarry is planned to take place as soon as possible, subject to the appropriate approval being granted and timing of the Pacific Motorway upgrade works. The expected operating life of the quarry is five (5) to seven (7) years subject to the duration of the upgrade works to the Pacific Motorway.

Concurrent Operation of Petersen's Quarry

Quarry Solutions has a contract to operate the Petersen's Quarry for Richmond Valley Council for a period extending beyond the expected five (5) to seven (7) year operating life of the Coraki Quarry. The Coraki Quarry will integrate the current extraction area and processing area of the Petersen's Quarry for the life of the project. Any quarry materials required by Richmond Valley Council through the life of the project will be sourced from the existing Petersen's Quarry resource area, crushed in the Coraki Quarry processing plant and stockpiled within the nominated Coraki Quarry stockpile areas.

Given that the extraction, processing, stockpiling and product loading activities will all be undertaken using the same equipment and personnel operating the Coraki Quarry there is no risk of significant cumulative noise and dust emissions.

7.5.5 Quarry noise assessment

In order to characterise the existing ambient noise environment at the locality, noise dataloggers were placed adjacent to the nearest residences to the north and east.

The noise datalogger locations are shown on Figure 28 Noise Monitoring Locations.

The noise dataloggers were programmed to provide a statistical noise level analysis based on 15-minute sampling periods continuously over the monitoring period. The recorded noise levels are presented as statistical components, which are described as:

L1: Noise level exceeded for 1 percent of the measurement period, referred to as the adjusted maximum sound pressure level.
L10: Noise level exceeded for 10 percent of the measurement period, referred to as the averaged maximum sound pressure level.
L90: Noise level exceeded for 90 percent of the measurement period. AS1055.1–1997 notes that the L90 is described as the background sound pressure level.
Leq An "average" measurement, and as per AS1055.1–1997 defined as the value of the sound pressure level of a continuous steady sound state, that within a measurement period, has the same mean square sound pressure as a sound under consideration whose level varies with time.

Table 11 below provides the minimum, maximum and average statistical noise levels recorded by the 'North' Location 1 noise datalogger.

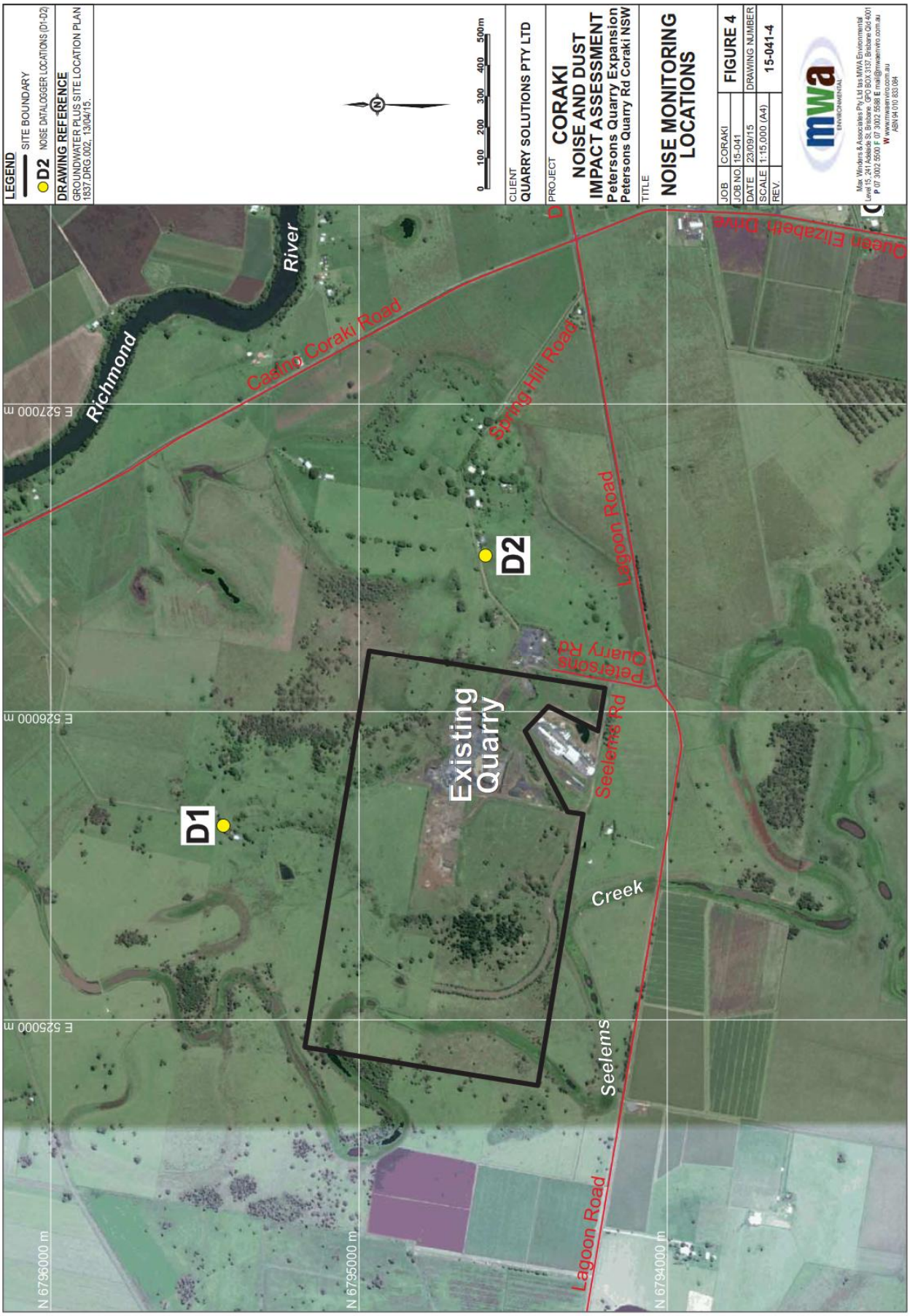
Table 11 Range of Datalogger Recorded Statistical Noise Levels 21 to 27 April 2015 'North' Location 1

Parameter	Period	Recorded Noise Levels – dB(A)		
		Minimum	Maximum	Average
L_1	Daytime (7am-6pm)	33.5	80.0	51.8
	Evening (6pm-10pm)	29.0	58.0	36.5
	Nighttime (10pm-7am)	28.5	76.0	50.3
L_{10}	Daytime (7am-6pm)	30.0	71.5	42.6
	Evening (6pm-10pm)	27.0	36.0	31.1
	Nighttime (10pm-7am)	27.0	64.5	41.9
L_{90}	Daytime (7am-6pm)	28.0	52.5	34.8
	Evening (6pm-10pm)	26.0	34.0	28.2
	Nighttime (10pm-7am)	26.0	56.0	32.8
L_{eq}	Daytime (7am-6pm)	29.0	70.0	43.7
	Evening (6pm-10pm)	26.5	47.5	31.4
	Nighttime (10pm-7am)	26.5	64.0	41.3

MWA Environmental is not aware of the operation of the Petersen's Quarry during the 'North' Location 1 noise datalogging period but notes that:

- There was no apparent operation of the Petersen's Quarry on 21 April 2015;
- There was no apparent operation of the Petersen's Quarry on 27 April 2015;
- More recent information regarding the Petersen's Quarry indicates that extraction and processing activities are occasional only; and
- The pit location where crushing is typically undertaken at the Petersen's Quarry is well topographically shielded from the 'North' Location 1 noise monitoring location.

Figure 28 Noise monitoring locations



On this basis it is expected that Petersen's Quarry operations did not influence the Rating Background Levels measured at 'North' Location 1. Table 12 below provides the minimum, maximum and average statistical noise levels recorded by the 'East' Location 2 noise datalogger.

Table 12 Range of Datalogger Recorded Statistical Noise Levels 12 to 21 August 2015 'East' Location 2

Parameter	Period	Recorded Noise Levels – dB(A)		
		Minimum	Maximum	Average
L_1	Daytime (7am-6pm)	42.6	71.8	53.5
	Evening (6pm-10pm)	30.9	55.9	42.1
	Nighttime (10pm-7am)	27.9	72.0	42.2
L_{10}	Daytime (7am-6pm)	34.4	65.7	44.7
	Evening (6pm-10pm)	28.2	48.2	35.9
	Nighttime (10pm-7am)	26.0	61.5	35.9
L_{90}	Daytime (7am-6pm)	27.8	55.3	33.7
	Evening (6pm-10pm)	25.1	42.2	28.1
	Nighttime (10pm-7am)	24.8	38.9	28.9
L_{eq}	Daytime (7am-6pm)	33.7	62.3	43.6
	Evening (6pm-10pm)	26.6	46.0	33.6
	Nighttime (10pm-7am)	25.6	59.1	34.0

The dataloggers used were an Acoustic Research Laboratories noise datalogger, model EL-215 (Location 1) and an Acoustic Research Laboratories noise datalogger, model EL-316 (Location 2). Each logger was pre-calibrated to 94 dB at 1kHz using a Rion Sound Level Calibrator, model NC-73. At post-calibration, the dataloggers exhibited less than ±0.5 dB deviation.

Quarry Solutions has advised MWA Environmental that the following activities occurred at the Petersen's Quarry during the 'East' Location 2 noise datalogging period:

- No extraction;
- No crushing or screening; and
- Loading and dispatch of between 50 tonnes to 370 tonnes of aggregates/roadbase on 13, 14, 18 & 19 August with no activity on other days – overall low numbers of trucks loaded and dispatched.

On this basis operations at the Petersen's Quarry during the 'East' Location 2 were limited to intermittent loading of trucks and would not have significantly influenced 1 hour average background noise levels or the measured Rating Background Levels. From the noise datalogger measurements, the following Table 13 details the measured Rating Background Levels (RBLs).

Table 13 Measured Rating Background Levels – dB(A)

Noise Monitoring Location	Time Period	RBL dB(A)
'North' Location 1	7am to 6pm	30
	6pm to 10pm	27
	10pm to 7am	28
'East' Location 2	7am to 6pm	30
	6pm to 10pm	26
	10pm to 6am	27

7.5.6 Relevant noise criteria

The relevant noise criteria for the assessment of noise impacts from the proposed development are taken from the *NSW Industrial Noise Policy*.

The NSW *Industrial Noise Policy* provides specific policy objectives:

- *to establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses; and*
- *to use the criteria as the basis for deriving project specific noise levels*

The appropriate noise criteria are established by means of a comparison between a 'Rating Background Level ("RBL") plus 5 dB(A)' 'Intrusiveness Criterion' and 'Amenity Criteria' levels, with the lower level being adopted as the basis for deriving project specific noise levels.

From the noise datalogger measurements, the RBLs measured at Noise Datalogger Locations 1 and 2 were 30 dB(A) for the 7am to 6pm period. For the early morning 6am to 7am and early evening 6pm to 7pm periods the minimum RBL of 30 dB(A) has been adopted for assessment of intrusive noise criteria in accordance with the NSW Industrial Noise Policy. This is consistent with the 7am to 6pm RBL.

On this basis, the relevant 'Intrusiveness Criterion' level for assessment of noise from the proposed quarrying activity is L_{Aeq} 35 dB(A) for the proposed operating hours 6am to 7pm.

From Table 2.1 of the *Industrial Noise Policy*, the appropriate 'Amenity Criteria' are as follows for "Residential receiver in a Rural area":

Time of Day	*Recommended L_{Aeq} Noise Level, dB(A)*	
	Acceptable	*Recommended Maximum*
Day (7am to 6pm)	*50*	*55*
Evening (6pm to 10pm)	*45*	*50*
Nighttime (10pm to 7am)	*40*	*45*

As the 'Intrusiveness Criterion' levels are lower than the 'Amenity Criteria' the more stringent 'Intrusiveness Criterion' level of L_{Aeq} 35 dB(A) is applied to the assessment of noise emissions from the proposed quarrying activities.

7.5.7 Quarry noise modelling methodology

To enable assessment of noise from the proposed quarrying operations a detailed noise model has been established using the SoundPLAN 7.3 software applying the CONCAWE noise propagation algorithms. The CONCAWE noise propagation method / algorithms were applied to the modelling to allow assessment of noise propagation under specific meteorological conditions e.g. wind directions.

This model is an accepted regulatory model that allows input of site-specific terrain data and source noise data as sound power level spectra.

Modelling has been undertaken based upon the layouts for the 'Initial Pit' and 'Final Pit' operations as per the 3D CAD plans provided by Groundwork Plus.

The source noise data was derived from measurements conducted by MWA Environmental at comparable and representative existing extractive industry facilities. The modelled sound power level data is provided in Attachment 3 of Attachment 6.

As discussed, given that the extraction, processing, stockpiling and product loading activities will all be undertaken using the same equipment and personnel operating the Coraki Quarry there is no risk of significant cumulative noise emissions from the Petersen's Quarry during the life of the project.

7.5.8 Topographic data

The model was established over an area of approximately 4km by 3km centred on the subject land. Digital elevation data for the locality and the subject land, including representations of the 'Initial Pit' and 'Final Pit' landforms was supplied by Groundwork Plus and integrated into the noise model.

7.5.9 Meteorological conditions

Site-specific meteorological conditions have been assessed based upon the meteorological modelling undertaken for the dispersion modelling. Analysis of the relevant meteorological parameters at the site during the operating hours 6am to 7pm for the purposes of noise assessment including stability classes and wind roses is provided in Attachment 4 of Attachment 6.

The analysis demonstrates that:

- Temperature inversion conditions, as Pasquill Gifford F-Class Stability, occur for approximately 6 percent of operating hours in the year; and
- Wind speeds of up to 3 m/s from directions within a 45 degree sector centred on the nearest residences to the north, south and east occur for less than 30 percent of operating hours during any season.

On the basis of the objective meteorological analysis in accordance with the NSW Industrial Noise Policy, temperature inversions and winds of up to 3 m/s from source to the nearest receivers are not assessed to be significant conditions for the purposes of this noise assessment.

7.5.10 Quarry noise modelling

The following noise sources were represented in the model:

Table 14 Noise Sources Used in SoundPLAN 7.3 Modelling

NOISE SOURCE	LOCATION
Primary (Jaw) Crusher	Existing Petersons Quarry Pit
3x Cone Crushers	
Primary Screen	
Secondary Screen	
Tertiary Screen	
Quaternary Screen	
Rock Drill	Lot 401 on DP633427 Resource Area
Rock Pick	
Excavator Loading Shot Rock	
Haul Trucks	Pit to Plant and Plant to Western Stockpiles routes
Loader at Southern Stockpiles	Southern Stockpiles
Loader at Western Stockpiles	Western Stockpiles
Product Trucks	50/50 split Seelems Road Entry and Petersons Quarry Road Entry routes

The above-listed sources are the key noise sources which are expected to operate at the quarry on a regular basis. Other plant items and vehicles may be required to be used at the quarry at times but should not increase overall noise emissions above the level of the above modelled noise sources operating simultaneously. The operating Sound Power Levels ("SWLs") of key processing and mobile equipment have been taken from source noise surveys conducted at comparable and representative existing extractive industry operations. A +5 dB(A) impulse adjustment to the Rock Pick SWL was applied by MWA Environmental to address the noise character of this source.

The modelled SWLs are summarised in Table 15 below.

Table 15: Sound Power Levels - LAeq,T - dB(A)

SOURCE	MODELLED SWL $L_{Aeq,T}$ - dB(A)	SOURCE REPRESENTATION
Primary Crusher	113	Point Source
Screen 1 & Cone Crusher 1	110	Point Source
Cone Crusher 2	109	Point Source
Crusher 3	109	Point Source
Screen 2	107	Point Source
Screen 3	105	Point Source
Screen 4	105	Point Source
Pit to Plant Haul Road (Dump Trucks) 5 loads per hour	75/m	Line Source
Plant to Western Stockpiles (Dump Trucks) 2.5 loads per hour	72/m	Line Source
Loader Loading Truck (1 hour work cycle)	104	Point Source
Loader Loading Truck (1 hour work cycle)	104	Point Source
Excavator Loading Truck[1] (1 hour work cycle)	110	Point Source
Rock Drill[2]	110	Point Source
Rock Pick	118[3]	Point Source
Access Road (7 loads per hour via each entry)	66/m	2x Line Sources

[1] Truck tray with impact absorptive lining
[2] Proprietary quietened rock drill
[3] Including +5dBA impulse adjustment

7.5.11 Noise control measures

Based upon an iterative noise modelling process, it has been determined that the following noise control measures are required to comply with the relevant noise limits:

1. The proposed Stockpile Area pads are relatively open and will require earth bunds and/or acoustic barriers to the following locations:
    a. Northern perimeter of the Western Stockpile Area to a minimum height of 6 metres above the RL21m pad level ('Screen 1')
    b. Southern perimeter of the Southern Stockpile Area to a minimum height of 4 metres above the RL40m pad level ('Screen 2')
    c. Northern perimeter of the Southern Stockpile Area to a minimum height of 4 metres above the RL40m pad level ('Screen 3')
2. The northern perimeter of the extraction area will require an earth bund and/or acoustic barrier to a minimum height of 6 metres above the natural ground level at the northern perimeter of the Extraction Area ('Screen 4').
3. Wherever practicable materials should be stockpiled at locations that shield noise from internal traffic routes and truck loading areas from the nearest residences i.e.:
    a. Maintain stockpiles along the northern perimeter of the Western Stockpile Area and stock / reclaim from the southern side whenever practicable
    b. Maintain stockpiles along the southern and eastern perimeters of the Southern Stockpile Area and stock / reclaim from the northern and western sides whenever practicable
4. An acoustic barrier and/or earth mound to a minimum height of 4 metres above the access road off Seelems Road shall be constructed ('Screen 5) for a length of 200 metres from the site entry point.
5. The processing plant shall be operated at the most shielded location available (e.g. at the southeastern corner of the existing Petersons Quarry pit at the RL18m bench) to the extent practicable. If not practicable then appropriate acoustic screening shall be installed to the crushers, screens and any other processing equipment as necessary to comply with the relevant noise limits. Commissioning phase testing is recommended to confirm acceptable siting and/or acoustic treatment of the processing plant.
6. Trays of all dump trucks that handle shot rock[4] and oversize material are to be lined with an appropriate absorptive material.
7. The rock pick should be operated at the most shielded location practically available within the pit to provide acoustic shielding to the north and east.
8. Drilling should be undertaken using a proprietary quietened drill rig e.g. Atlas Copco SmartRig ROC D9C.
9. Extraction sequencing should be designed such that the drill rig is shielded to the north by retained topography of minimum height 5 metres above the drilling pad level and supplemented with earth mounding and/or acoustic barriers as necessary to achieve the overall physical shielding.
10. The internal traffic routes at the northeastern perimeter to be shielded by topographic cut, earth bund and/or acoustic barrier directly to the northeast of the traffic routes to a minimum height of 4 metres above the adjacent traffic route ('Screen 6). It is noted that the northwestern section of 'Screen 6' is not required once the internal traffic route is directed through the extraction area (pit) as the retained topography will achieve the required shielding.
11. All internal roads for road haulage and off-road trucks should be constructed and maintained to avoid excessive noise associated with uneven surfaces and potholes.
12. It is recommended that mobile plant (e.g. front-end loaders, dozers, haul trucks, excavators) be fitted with broadband reversing alarms to mitigate potential nuisance from tonal characteristics of traditional beeper alarms.

[4] i.e. pit to plant haulage

The acoustic 'Screen' locations are shown on Figure 28 Acoustic screening. The acoustic 'Screens' may be constructed of any combination of earth bunding, acoustic barrier and/or additional topographic cut to achieve the necessary total height. We note that an acoustic barrier should be constructed as gap-free (less than 1% leakage) and of materials achieving a minimum surface density of 12.5kg/m.

Based upon the modelling and assessment undertaken by MWA Environmental, all of the above noise control measures are necessary to comply with the relevant noise criteria at surrounding sensitive receptors. The relative importance of each measure is difficult to articulate given that the noise reduction achieve by each measure varies for each noise source and for each receptor location. Whilst each measure in isolation may achieve an incremental reduction in overall noise from the quarry at different receptor locations the cumulative effect of all recommended noise mitigation measures has been assessed to be sufficient to comply with the relevant noise criteria at all receptors. Previous experience with hard road quarrying indicates that critical noise sources to mitigate to avoid nuisance are:

- Crushing and screening plant; and
- Heavy mobile equipment operating at exposed locations (e.g. rock drills, dump trucks).

It is understood that the landowner of Lot 401 also owns Lot 4 on DP6339 to the north containing the residence R7. If the applicant is able to reach a commercial arrangement with the landowner such that R7 is not a noise sensitive place for the purposes of the operation of Coraki Quarry then the noise control measured numbered 1a, 3a and 9 are not required. If the applicant is able to reach a commercial arrangement with the landowner of Lot 12 DP6339 to the south, such that R1 is not a noise sensitive place for the purposes of the operation of Coraki Quarry then the noise control measured numbered 1b, 3b and 4 are not required. In addition to the above specific noise control measures, all fixed and mobile plant and equipment operated at the site should be selected and maintained to minimise noise emissions.

7.5.12 Noise modelling results

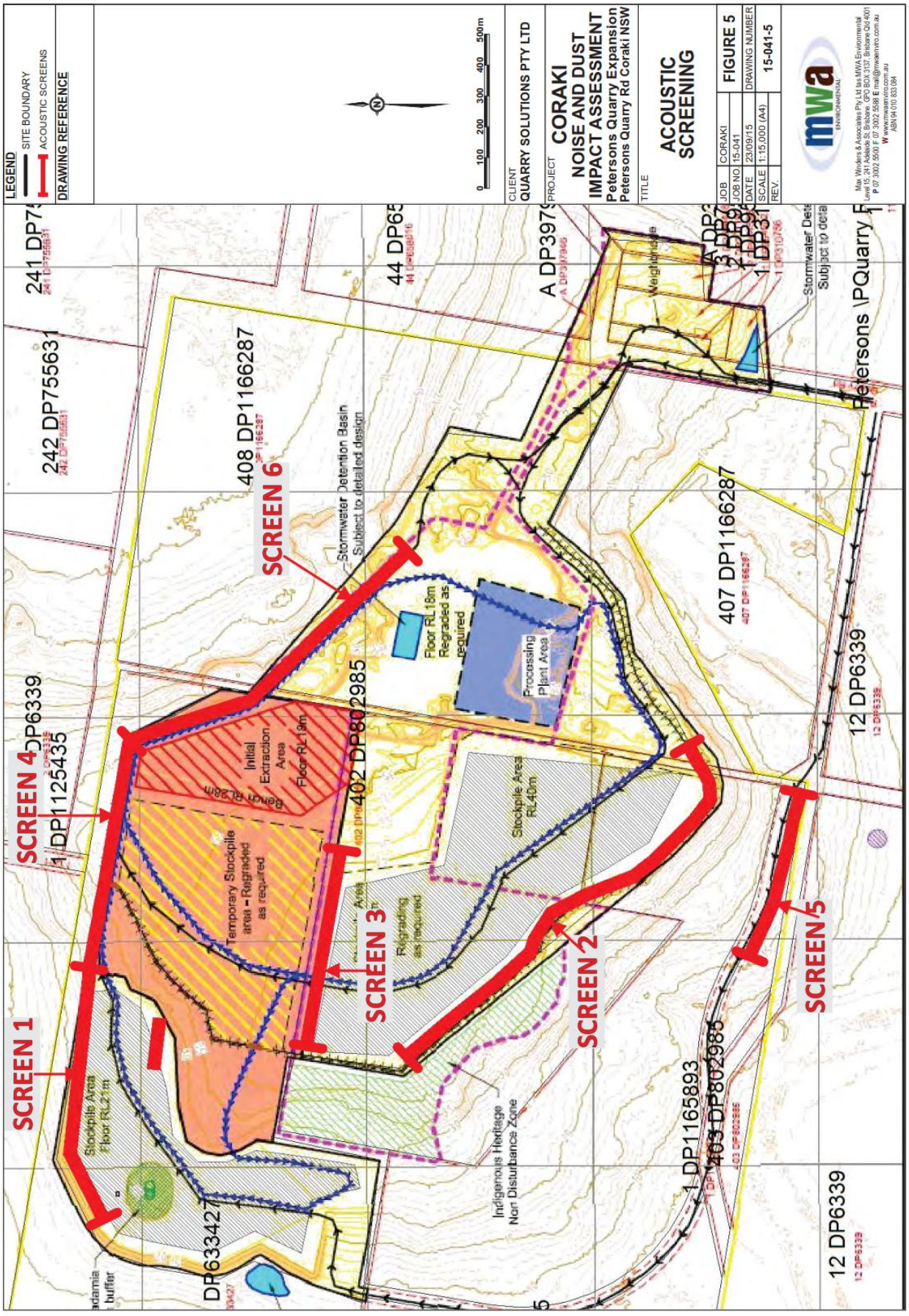
The results of the SoundPLAN 7.3 modelling for the 'Initial Pit' and 'Final Pit' operation scenario are provided in Attachment 5 of Attachment 6 as contours of predicted resultant noise levels on a cadastral base showing the locations of the representative surrounding residences. The predicted resultant noise levels at the representative receptor locations are summarised in Table 6 below.

Table 16 Summary of Model Results for Receptors – dB(A) 'Initial Pit' and 'Final Pit' Scenarios

RECEPTOR	PREDICTED L_{Aeq} NOISE LEVEL - dB(A)		*NOISE CRITERION* L_{Aeq} - *dB(A)*
	INITIAL PIT	FINAL PIT	
R1	35	35	*35*
R2	35	35	*35*
R3	33	34	*35*
R4	28	28	*35*
R5	27	27	*35*
R6	35	35	*35*
R7	35	35	*35*
R8	24	27	*35*
R9	23	24	*35*

The model-predicted quarry noise levels at the industrial facility (concrete panel manufacturer) on Lot 407 on DP1166287 to the southeast range 41 to 47 dB(A) L_{Aeq} with the noise control measures. This is noted to be compliant with the NSW Industrial Noise Policy 'amenity criteria' for 'Industrial Premises' which are an 'Acceptable' level of 70 dB(A) L_{Aeq} and a 'Recommended Maximum' level of 75 dB(A) L_{Aeq}.

Figure 29 Acoustic screening



7.5.13 Outcomes of quarry noise modelling

On the basis of the noise assessment conducted, the predictions demonstrate that, subject to the implementation of the noise mitigation measures, the proposed quarrying activities can comply with the relevant noise criteria at surrounding sensitive receptors and the industrial facility on Lot 407 on DP1166287. Detailed consideration should be given to the requirement to shield and/or acoustically treat the processing plant and to the most practical methods of achieving the acoustic shielding required through the use of topographic cut, earth bunds and/or barriers at various locations.

7.5.14 Monitoring

The controls nominated for the project will require regular monitoring and review to ensure that performance accords with design criteria and also reflect the dynamic nature and changing needs of the operation. Accordingly, the Quarry Manager will:

- Ensure regular surveillance of the site to qualitatively assess noise generation from plant and machinery.
- Ensure all plant and machinery and vehicles are serviced in accordance with, or more frequently than, manufacturers' specifications.
- Initiate a noise survey when requested by the administering authority, or as otherwise deemed necessary, to investigate a noise complaint.

Methods for measurements and reporting of noise monitoring will comply with the current edition of the NSW Industrial Noise Policy. The measurement and reporting of noise levels will be undertaken by a person or body possessing both the qualifications and the experience appropriate to perform the required measurements.

The Petersons Quarry has been in operation for many years including activities and locations representative of the project. The modelling and assessment conducted as part of this EIS has determined that implementation of a comprehensive range of noise management measures can adequately minimise noise impacts. Accordingly, it is considered real time monitoring is not necessary in this instance. It is proposed that routine monitoring will be undertaken on an annual basis to assess compliance with the relevant conditions of approval and a copy of the annual compliance report made available to the relevant authorities if requested. Monitoring locations will include Lot 12 DP714770, Lot 12 DP6339 and Lot 4 DP6339 subject to the consent of those land owners. A weather station will be installed on site for the life of the project to accurately record the relevant atmospheric conditions. Monitoring will include:

- LAmax, adj, T
- Background noise (Background) as LA 90, adj, T or Labg, T
- Max LpA,T
- The level and frequency of occurrence of any impulsive or tonal noise effects due to extraneous factors such as traffic noise
- Atmospheric conditions including wind speed and direction
- Effects due to extraneous factors such as traffic noise
- Location, date and time of recording.

7.5.15 Road traffic noise assessment

The assessment by MWA Environmental also considered road traffic noise at residences within 100m of the proposed haulage route to the Pacific Highway and considered the relevant criteria specified in the NSW Road Noise Policy (Department of Environment, Climate Change and Water NSW, 2011). The relevant noise criteria was determined to be those for, "existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments".

Coraki-Woodburn Road, Queen Elizabeth Drive and Casino-Coraki Road are sub-arterial category roads and thus the relevant criteria for the Day period (7am to 10pm) is L_{Aeq}(15 hour) 60dB(A). Whereas for the Night period (10pm to 7am

is L_{Aeq}(9 hour) 55dB(A). Seelems Road, Petersons Quarry Road and Lagoon Road are local category roads with the relevant criteria generally being, L_{Aeq}(1 hour) 55dB(A) for the Day period and L_{Aeq}(1 hour) 50dB(A) for the Night period.

Consideration was given to the proximity of the residence at 228 Lagoon Road to the sub-arterial road network and in that instance the sub-arterial assessment criteria was applied. Therefore, only the residence at 200 Lagoon Road, located immediately to the south of the Seelems Road entry to the project was considered to fall within the local road category for the relevant noise criteria assessment of 55dB(A) and 50dB(A) for the Day and Night periods respectively.

For circumstances where the existing 'background' road traffic noise levels are close to, or exceed, the nominated assessment criteria, the NSW Road Noise Policy provides for an assessment of the land use development impacts against a 'Relative Increase' criteria of up to 2dB as a minor impact that is barely perceptible to the average person.

Road traffic noise monitoring was conducted over a 24 hour period (12 to 13 August 2015) at three locations adjacent to the haulage route shown on Figure 30 and correlated with the traffic counts undertaken during the period of 11 to 17 August 2015 for the purpose of model validation and assessment of the background traffic volumes over the assessment period. The traffic noise model was conducted using the SoundPLAN 7.3 software applying the accepted CoRTN traffic noise prediction methodology.

Prevailing meteorological conditions during the monitoring period were generally fine with several brief periods of light rainfall. Wind conditions were calm to light northerly during the mornings of 12 and 13 August 2015 and moderate to strong winds on the afternoon of 12 August 2015. Winds were relatively light during the evening and night period on 12 August 2015. Whilst the period of elevated wind speeds on the afternoon of 12 August 2015 would have affected the measured noise levels the overall impact is considered to be acceptable considering the purpose of the monitoring and proximity of the monitoring locations to the dominant road traffic noise source. The noise monitoring was conducted using Rion NL-21 and Rion NL-42 noise datalogger units which were pre-calibrated to a reference signal of 94 dB at 1kHz. No calibration drift was observed post-measurement.

Site specific topographic information was input to the model for a domain extending from the quarry access to the Pacific Highway based upon NSW Government Land & Property Information 10 metre topographic contours. The road centreline was digitised from review of NSW Globe imagery.

Residential dwellings identified as being within 100 metres of the haulage route were input to the model as discrete receptor. For the section of the haulage route through the township of Coraki, a limited number of dwelling locations were nominated for the purposes of the assessment on the basis that the selected receptors are representative of the dwellings nearest to this section of the haulage route. Other residential dwellings through the Coraki township along Queen Elizabeth Drive are similarly or less exposed to road traffic noise.

Based upon the traffic counts undertaken, average traffic speeds are below the posted speed limits due to the characteristics of the roads. The measured average traffic speeds have been applied to the appropriate road sections for the purposes of the modelling.

The model was setup to represent the design scenario traffic as per Section 3.3 of Attachment 6 for the following assessment periods:

- 15 Hour (7am to 10pm)
- 9 Hour (10pm to 7am)
- AM Peak Hour (7am to 10pm) – relevant to 200 Lagoon Road only
- Night Peak Hour (6am to 7am) - relevant to 200 Lagoon Road only

Residential dwellings within 100 metres of haulage route were represented as discrete receptors in the model. It is noted that the nominated dwelling receptor locations through the Coraki township are representative of dwelling nearest to the roadway along this section of the haulage route. Other residential dwellings through the township of Coraki are similarly or less exposed to road traffic noise compared to the nominated representative receptors.

Figure 30 Road traffic noise monitoring locations

Model predicted LAeq 15 Hour (7am to 10pm) and LAeq 9 Hour (10pm to 7am) noise levels (including façade reflection) at each residential dwelling in proximity to a sub-arterial category road are summarised in Table 17 below.

Table 17 Summary of Model Predicted 15 Hour (7am to 10pm) & 9 Hour (10pm to 7am) Noise Levels

RECEPTOR	MODEL PREDICTION - at façade - dB(A)			
	L_{Aeq} (15 hour) Average		L_{Aeq} (9 hour) Average	
	With Development Overall Level	Increase as a Result of Development	With Development Overall Level	Increase as a Result of Development
R1	54.9	2.1	50.6	0.4
R2	56.6	2.1	52.3	0.5
R3	60.1	1.6	54.8	0.4
R4	54.1	2.2	49.8	0.4
R5	58.9	1.8	54.1	0.4
R6	60.4	1.5	55.1	0.4
R7	52	2.1	47.6	0.4
R8	52.4	2.1	47.7	0.5
R9	59.1	1.7	54.3	0.5
R10	56.2	7.8	47.3	4.8
R11	59.9	1.6	54.7	0.4
R12	58.6	1.9	53.9	0.4
R13	60.3	1.6	55	0.4
R14	Refer Table 13 below			
R15	56.8	2.1	52.4	0.5
R16	59.8	1.6	54.7	0.5
R17	59.1	1.9	54.3	0.4
R18	58.1	1.9	53.8	0.4
R19	49.7	2	45.9	0.5
R20	62.7	1.3	56.7	0.4
R21	59.2	1.7	54.3	0.5
R22	61.6	1.6	55.8	0.6
R23	52.1	2	47.3	0.6
R24	56.2	2	51.2	0.6
R25	63.2	1.5	57.1	0.7
R26	64.2	1.3	57.7	0.6
R27	58.3	2.1	53.5	0.7
R28	49.3	2.1	45.6	0.4
R29	56	1.7	51.3	0.4
R30	59.9	2	54.9	0.6
R31	59	2	54	0.6
R32	61.2	1.7	55.6	0.6
R33	64.6	1.2	58	0.6
R34	61	1.7	55.6	0.7
R35	52.7	2	47.9	0.6
R36	57.8	2	52.9	0.6
R37	62.6	1.5	56.7	0.6
R38	63	1.5	56.9	0.6
R39	61.6	1.7	56	0.6
R40	60.3	1.8	55.1	0.6
R41	52	2.3	47.2	0.7
R42	56.9	2.1	52	0.7
R43	54.8	2.1	50	0.7
R44	56	2.1	51.1	0.6
CRITERION	*60dBA ASSESSMENT CRITERIA*	*2dBA IF ASSESSMENT CRITERIA EXCEEDED*	*55dBA ASSESSMENT CRITERIA*	*2dBA IF ASSESSMENT CRITERIA EXCEEDED*

Model predicted L_{Aeq} 1 Hour (7am to 10pm) and L_{Aeq} 1 Hour (10pm to 7am) noise levels (including façade reflection) at the 200 Lagoon Road dwelling in proximity to a local category road are summarised in Table 13 below.

Table 18 Summary of Model Predicted 1 Hour (7am to 10pm) & 1 Hour (10pm to 7am) Noise Levels

RECEPTOR	MODEL PREDICTION - at façade - dB(A)			
	L_{Aeq} (1 hour) 7am to 10pm		L_{Aeq} (1 hour) Average 10pm to 7am	
	With Development Overall Level	Increase as a Result of Development	With Development Overall Level	Increase as a Result of Development
R14	43.4	3.9	41.1	7.4
CRITERION	*55dBA ASSESSMENT CRITERIA*	*2dBA IF ASSESSMENT CRITERIA EXCEEDED*	*50dBA ASSESSMENT CRITERIA*	*2dBA IF ASSESSMENT CRITERIA EXCEEDED*

7.5.16 Outcomes of the traffic noise modelling

Based upon the road traffic noise modelling conducted it has been determined that:

1. For 14 of the 43 nominated dwellings in proximity to the sub-arterial category haulage roads, compliance is predicted to be achieved with the 60 dB(A) L_{Aeq} (15 hour) (7am to 10pm) assessment criteria specified in the NSW *Road Noise Policy* for "*existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments*".
2. For 12 of the 43 nominated dwellings in proximity to the sub-arterial category haulage roads, compliance is predicted to be achieved with the 55 dB(A) L_{Aeq} (9 hour) (10pm to 7am) assessment criteria specified in the NSW *Road Noise Policy* for "*existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments*".
3. For the 200 Lagoon Road residence, compliance is predicted to be achieved with the 55 dB(A) L_{Aeq} (1 hour) (7am to 10pm) and 50 dB(A) L_{Aeq} (1 hour) (10pm to 7am) assessment criteria specified in the NSW Road Noise Policy for "*existing residences affected by additional traffic on existing local roads generated by land use developments*".
4. For residences where the cumulative L_{Aeq} (15 hour) (7am to 10pm) noise level post-development is predicted to exceed the 60 dB(A) assessment criteria, the increase as a result of the development does not exceed 2dB(A). This is considered to be a minor change in accordance with the NSW *Road Noise Policy* and impacts are unlikely to warrant mitigation works, particularly considering the purpose and limited operational life of the proposed development.

7.6 Dust

MWA Environmental undertook an assessment of potential dust impacts from the project (refer Attachment 6) which is presented below for ease of reference.

7.6.1 Ambient dust concentrations

Ambient air quality monitoring data was sourced from the NSW Office of Environment and Heritage. Routine ambient particulate monitoring is not undertaken in close proximity to Coraki. The monitoring station selected for representative ambient concentrations is Wyong, located on the central coast. A summary of the ambient particulate data applied to this assessment is provided in Table 19 below.

Table 19 Ambient Particulate Data Applied to Assessment

POLLUTANT	AVERAGING TIME	AMBIENT ($\mu g/m^3$)*	SOURCE
TSP	Annual Average	30.1	Conservative assumption of double Wyong Year 2014 PM_{10} Annual Average
PM_{10}	24 Hour Average	17.2	70th percentile Wyong Year 2014 PM_{10} 24 hour average
	Annual Average	15.1	Wyong Year 2014 PM_{10} Annual Average
$PM_{2.5}$	24 Hour Average	6.2	70th percentile Wyong Year 2014 $PM_{2.5}$ 24 hour average
	Annual Average	5.5	Wyong Year 2014 $PM_{2.5}$ Annual Average
Dust Deposition	Annual Average	40 $mg/m^2/day$ 1.2 $g/m^2/month$	Assumption based upon typical data

** unless stated otherwise*

In selecting the Wyong monitoring station as the most representative yet conservative basis for assessing ambient particulate concentrations at the Coraki site, consideration was also given to the alternative sites summarised in Table 20 below.

Table 20 Summary of Alternative Ambient Monitoring Sites

Pollutant	PM_{10}					$PM_{2.5}$	
Location	Wyong	Tamworth	Bathurst	Mountain Creek	Springwood	Wyong	Springwood
Distance from Coraki	500km	320km	600km	260km	160km	500km	160km
Site Description	"Central Coast"	"Rural Monitoring Site"	"Rural Monitoring Site"	"South East QLD"	"South East QLD"	"Central Coast"	"South East QLD"
Climatic and Land use Character	Similar coastal climate, larger population centre, more dense transport	More arid climate, larger population centre	More arid climate, larger population centre	Similar coastal climate, larger population centre, more dense transport	Similar coastal climate, major urban area, more dense transport	Similar coastal climate, larger population centre, more dense transport	Similar coastal climate, major urban area, more dense transport
Statistic	Adopted	2010-2014 Period Data				Adopted	2010-2014 Period Data
70th percentile	17.2	16.8	14.5	15.9	14.7	6.2	5.3
Annual Average	15.1	14.7	12.7	14.3	13.4	5.5	4.7

In assessing the above alternative ambient monitoring sites, Wyong was considered the most appropriate dataset based upon, the most consistent climatic conditions to Coraki and the adopted ambient concentrations from the Wyong dataset are higher (more conservative) than the alternative station averages.

7.6.2 Relevant dust guidelines

This assessment has also addressed the particulate air quality objectives specified in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2005).* The adopted assessment criteria for particulate emissions associated with the proposed quarrying activities are summarised in Table 21 below.

Table 21 Applicable Particulate Objectives

POLLUTANT	AVERAGING PERIOD	GUIDELINE	SOURCE
TSP	Annual Average	90 µg/m^3	NSW Approved Methods
PM_{10}	24 Hour Average (6th highest)	50 µg/m^3	Air NEPM
	Annual Average	30 µg/m^3	NSW Approved Methods
$PM_{2.5}$	24 Hour Average	25 µg/m^3	Air NEPM
	Annual Average	8 µg/m^3	Air NEPM
Dust Deposition	Annual Average (increment)	2 g/m^2/month	NSW Approved Methods
	Annual Average (Total Cumulative)	4 g/m^2/month	NSW Approved Methods

7.6.3 Dust modelling methodology

To enable assessment of dust concentrations and deposition rates from the proposed quarrying operations, detailed dispersion modelling has been conducted using the CALMET / CALPUFF modelling system.

The CALMET / CALPUFF modelling system considers 3-dimensional unsteady state meteorology and is suitable for modelling pollutant transport on a regional scale and for complex terrain and coastal zones. The CALMET / CALPUFF modelling system simulates the effects of spatially and time varying meteorology on pollutant transport within the model domain, including chemical transformation and removal. CALPUFF considers emissions as a series of puffs that, if emitted at a sufficient frequency, simulate a continuous emission. This representation of the plume as a series of puffs allows the pollutant transport to vary spatially across the model domain in accordance with the 3-dimensional meteorological field.

A site-specific 3-dimensional prognostic meteorological dataset generated using TAPM was processed using the CALMET program to provide meteorological inputs in a form suitable for the CALPUFF dispersion model. The terrain and land use resolution was refined to a 200 metre grid for the CALMET / CALPUFF modelling to ensure a reasonable representation of the terrain at the locality. CALMET prepares 3-dimensional meteorological data for each hour of the CALPUFF run based upon the 3-dimensional prognostic dataset generated using TAPM.

The CALMET / CALPUFF model was set up to model dispersion within a 10 km x 10 km area surrounding the subject site. The topography of the subject site and surrounding area was sourced from NASA Shuttle Radar Topography Mission (SRTM3) digital elevation data at a resolution of 200 metres. The CALPUFF model was then nested by a factor of four to a finer receptor grid of 50 metres over the modelling domain. The CALPUFF sampling domain was limited to a 3.2 km x 2.4 km area encompassing the nearest sensitive receptor locations.

Emissions estimation and CALPUFF dispersion modelling has been undertaken for the Final Extraction Stage. The assessment of the Final Extraction Stage is deemed the worst-case as this stage has the longest onsite vehicle paths for haulage between pit and plant and from plant to the northern stockpile area. The size of the active pit area and stockpile areas for the Final Extraction Stage is also larger than earlier stages, with these exposed areas subject to wind erosion. The outcome of this is that potential particulate emissions from the quarry are highest during the Final Extraction Stage.

Product trucks are equally distributed between accessing the northern stockpile via Seelems Road and the southern stockpile via Quarry Road. Haulage of material via dump truck and product trucks is a major contribution to total particulate emissions generated from the site.

The assessment has conservatively assumed an extraction and production rate at the proposed maximum limit of 1 million tonnes per annum.

As discussed, given that the extraction, processing, stockpiling and product loading activities will all be undertaken using the same equipment and personnel operating the Coraki Quarry there is no risk of significant cumulative dust emissions from the Petersen's Quarry during the life of the project.

Dust concentrations and deposition rates have been assessed at representative discrete receptors. Gridded receptor modelling has also been undertaken to produce contours of the predicted dust concentrations and deposition rates over the model domain.

The model-predicted dust concentrations and deposition rates due to emissions from the proposed quarrying activities were added to the ambient concentrations presented above to assess the cumulative dust exposure at surrounding receptors.

In order to assess the potential dust deposition from the quarry it was necessary to model a particle size distribution. Whilst the actual particle size distribution of various sources and materials does vary, it is considered reasonable to apply a generalised particle size distribution for the purposes of this modelling. The modelled particle size distribution was derived from the following data included in the USEPA AP42 Chapter 13.2.4 *Aggregate handling and Storage Piles.*

7.6.4 Meteorological data

No site-specific meteorological data was available for this assessment. In the absence of site specific data, following accepted methodology for assessment, the TAPM software was utilised to develop a prognostic meteorological model which generated a year of representative hourly meteorological data for the locality.

TAPM has been used to predict meteorological parameters specific to the area surrounding the subject site including temperature, wind speed, wind direction and stability classification. The model accesses databases of surface characteristics (terrain height, soil and vegetation) and synoptic weather analyses provided by CSIRO to carry out these analyses. TAPM is able to process the output data to produce meteorological data files suitable for input to the CALMET / CALPUFF modelling system i.e. a 3-dimensional grid of hourly varying meteorological parameters over a full year.

The centre coordinates for the model grid were Latitude -28o58'30" and Longitude 153o16'. The following nested model grids were applied to the TAPM modelling:

40 x 30 km grid (total area 1200 km x 1200 km)
40 x 10 km grid (total area 400 km x 400 km)
40 x 3 km grid (total area 120 km x 1204 km)
40 x 1 km grid (total area 40 km x 40 km)

Twenty-five vertical grid levels were modelled. The TAPM model was set up to generate a site-specific meteorological data file for the locality, based upon synoptic analysis data for the representative Year 2010, as provided by CSIRO.

The nearest Bureau of Meteorology (BoM) stations are located at Lismore and Casino. Lismore is located north of Coraki, however review of the area surrounding Lismore indicates elevated terrain to the east and west. No significantly elevated terrain is located surrounding Coraki. Lismore observation data was included as nudging observations in TAPM with a 5 kilometre radius of influence due to the proximity of surrounding terrain. Casino is located further inland than Coraki and is not located in proximity to any elevated terrain. Casino observation data was included as nudging

observations in TAPM with a 20 kilometre radius of influence with the station being more representative of the prevailing meteorology of the surrounding region.

The TAPM output was processed using the CALTAPM software to produce a 3-dimensional data file suitable for input to the diagnostic CALMET model as an 'initial guess field'. The CALMET model further resolved the prognostic meteorology to a finer terrain, land use and soil type resolution of 200 metres over a 10 x 10 km area covering the subject site and surrounding region for the purpose of dispersion modelling.

Analysis of the CALMET derived meteorology for the subject land including a wind rose, wind frequency graph, monthly average temperatures graph and tabulated stability class analysis is contained in Attachment 7 of Attachment 6.

7.6.5 Dust emission sources

The following sources were represented in the CALPUFF Model:

- Haul Routes (unpaved) as a series of area sources;
- Access Roads (unpaved) as a series of area sources;
- Access Roads (paved) as a series of area sources;
- Wind Erosion from stockpiles and unsealed areas as area sources;
- Drilling as an area source;
- Loading Truck at Pit as an area source;
- Main Processing Plant operation as an area source;
- Loading to Stockpiles as an area source; and
- Loading from Stockpiles to trucks as an area source.

Dust emissions from each of these sources have been represented in the CALPUFF model as area sources with appropriate locations, sizes and initial dispersion parameters to represent the releases.

Emissions rates for each of the above sources have been calculated using published emission factors from the following references:

- NPI Emission Estimation Technique Manual for Mining v3.1, Environment Australia (2012);
- USEPA AP42 Chapter 13.2.2 Unpaved Roads (2006);
- USEPA AP42 Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing (2004); and
- USEPA AP42 Chapter 13.2.4 Aggregate Handling and Storage Piles (2006).

Emission rates have been estimated based upon extraction and production rate at the currently approved limit of 1 million tonnes per annum and distributed for each source based upon the proposed operating hours.

In accordance with the method presented in the NPI Emission Estimation Technique Manual for Mining v3.1, wind erosion emissions have only been represented when wind speed is greater than a 5.4m/s threshold.

A summary of the emission rate estimation techniques, emission factors and emission rates for the quarrying operations are included as Attachment 8 of Attachment 6. Also included in Attachment 8 of Attachment 6 is a summary of the calculated particulate emission rates for each major source group based upon the adopted emission factors and including the control measures recommended below.

The emission estimations and prior experience demonstrate that the key particulate emission sources at a quarry are:

- Vehicles operating on unsealed roadways (product truck routes and pit-to-plant haulage); and
- Crushing and screening plant including conveyor drop points.

The management of particulate emissions from these two key emission sources will be critical and specific recommendations for dust control measures are recommended below.

7.6.6 Dust control measures

It is recommended that the following dust control measures are implemented at the quarry:

- Watering of all haul roads and access roads at a rate of at least 2 litres/m^2/hour at times when dust emissions are visible from vehicle movements;
- Sealing (e.g. asphalt) part of the access road off Seelems Road for a minimum length of 200 metres west from the Seelems Road entry point;
- Enclosure and/or use of effective water sprays to crushers and screens within the permanent processing plant;
- Effective water misting sprays to permanent processing plant at transfer points including load-out points from elevated storage bins if utilised;
- Rock drill to have an appropriate dust extraction system with collector fitted to rig and/or wet drilling via water sprays; and
- Management of dust emissions from stockpiles during high wind speed conditions through appropriate use of sprinklers and/or chemical suppressant products as required.

The above dust control measures have been considered in dust emission estimation calculations presented in this report.

All of the above dust control measures are recommended as appropriate to manage emissions from the proposed quarry but, as noted above, the most critical dust management measures relate to:

- The watering of unsealed roads;
- Sealing of the section of access road adjacent the Seelems Road entry points; and
- Effective water misting sprays to permanent processing plant.

The recommended dust control measures are proven and practical methods of effectively managing particulate emissions from quarrying activities. Subject to compliance with the relevant air quality objectives, there is no requirement for the implementation of more complex, costly and/or operationally challenging methods.

7.6.7 Dust modelling results

Summaries of the model-predicted dust concentrations and deposition rates at the selected representative receptors for the Final Extraction Stage are provided in Table 17 of Attachment 6. Other residential dwellings within the model domain are no more affected than the selected representative receptors.

The results of the gridded receptor modelling for each scenario are presented in Attachment 9 of Attachment 6 as contours of predicted particulate concentrations and deposition rates over an aerial photograph base.

The modelling conducted demonstrates that, with the recommended dust management measures, the proposed quarrying activities can comply with the relevant air quality objectives at all surrounding residences. On this basis, with the implementation of appropriate dust management there will be no requirement to consider reductions in the duration, intensity or nature of activities on the site which would inhibit the ability of the project to achieve the objective of servicing the Pacific highway upgrade project.

The overall contributions of the quarry to the local airshed for the expected 5 to 7 year life of the project are also summarised in Table 17 of Attachment 6. MWA Environmental notes that for the annual average objectives the highest overall development contributions at any receptor range 7% to 16% of the air quality objectives. This is considered to be an acceptable incremental contribution from a development in a rural locality that is not expected to be subject to significant intensification in urban or industrial land uses within the expected 5 to 7 year life of the project.

The maximum predicted 24 hour average PM2.5 concentration at any receptor relates to an increment of 18% of the air quality objective. Again, this is considered to be an acceptable incremental contribution from a development in a rural locality that is not expected to be subject to significant intensification in urban or industrial land uses within the expected 5 to 7 year life of the project.

The maximum predicted 6th highest PM10 24 hour average concentration at any receptor relates to an increment of 59% of the air quality objective. Whilst a significant contribution to the airshed capacity in terms of the peak 24 hour periods, the overall impact is considered to be acceptable considering that:

- In this rural locality it is unlikely that significant cumulative impacts at residential receptors would occur during the same 24 hour periods when specific wind alignments generate peak impacts occur from the quarry at a particular receptor.
- The limited 5 to 7 year expected life of the project dictates that project contributions to the aished capacity will not persist over an extended project life.
- The limited 5 to 7 year expected life of the project reduces the likelihood that any new land uses with the potential to generate significant cumulative impacts will occur during the project life.
- Annual average PM10 contributions remain low at 16% of the air quality objective.

7.6.8 Monitoring

The Environmental Management Plan includes an Air Quality (Dust) Management Plan, prepared to control potential air quality impacts occurring as a result of land disturbance and operations necessary for the project. The performance targets adopted for the project include, that dust and particulate matter are not to exceed the following levels when measured at the boundary of any sensitive receptor:

- dust deposition of 4 g/m2-month (130 mg/m2-day), when monitored in accordance with Australian Standard AS 3580.10.1 Methods for sampling and analysis of ambient air – Determination of particulates – Deposited matter – Gravimetric method; and
- an aerodynamic diameter of less than 10 µm (PM10) suspended in the atmosphere of 50 µg/m3 over a 24 hour averaging time when monitored in accordance with Australian Standard AS 3580.9.6 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM10 high volume sampler with size-selective inlet – Gravimetric method.

The modelling and assessment conducted for this EIS determined that compliance with the performance targets can be achieved, accordingly real time monitoring is not considered necessary in this instance. However, the controls nominated for the project will require regular monitoring and review to ensure that performance accords with design criteria and also reflect the dynamic nature and changing needs of the operation.

Daily visual surveillance will be undertaken by all employees to ensure dust generation on site is controlled appropriately. Dust and particulate monitoring will be undertaken as required in accordance with the relevant conditions of the EPL but at least monthly. Monitoring will be carried out at a place relevant to the potentially affected, nuisance-sensitive place. Monthly dust deposition monitoring will be undertaken at Lot 12 DP714770, Lot 12 DP6339 and Lot 4 DP6339 subject to the consent of those land owners. Monitoring will be undertaken by a suitably qualified person in accordance with:

- Australian Standard AS3580.10.1 of 2003 – Determination of particulate matter – Deposited matter – Gravimetric method (or most recent edition).
- Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2001).
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA 2001).

A weather station will be installed on site for the life of the project to accurately record the relevant atmospheric conditions. When requested to undertake monitoring, monitoring results are to be provided to the administering authority following completion of the monitoring event. Monitoring shall be carried out at a place(s) relevant to the potentially affected dust sensitive place and must include:

- for a complaint alleging dust nuisance, dust deposition.
- for a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere over a 24hr averaging time.

7.7 Vibration and blast fumes

7.7.1 Vibration management

Vibration from extractive industry operations is generally restricted to blasting activities. Blasting is used to fragment rock and this activity can result in ground vibration and air over pressure which may cause annoyance and alarm to neighbours. Blasting and explosives technology and practices have advanced rapidly in recent years. Application of leading practice technology to operating practice can be particularly effective in maintaining ground vibration and airblast overpressure to within acceptable environmental levels. Ground vibration at quarry sites can be caused by crushing and screening operations, vehicle and mobile machinery movements and drilling and blasting activities. With the exception of blasting, ground vibration from these sources is limited and localised and extremely unlikely to cause annoyance external to the Site. Airblast refers to the sound pressure level or noise level which is generated primarily from the displacement of rock mass during the blasting process. At most quarries the only significant source of airblast overpressure relates to blasting activities.

Quarry Solutions is committed to applying modern blasting technology to the quarry operation. Experienced and licensed organisations will be contracted to provide blasting services on the site including laser surveying of quarry face profile; blasthole design and layout; blasthole deviation measurement; explosives loading and blast initiation planning; priming, loading, stemming and initiation of blast; ground vibration/airblast monitoring; blast fume management and reporting. Various options are available for controlling vibration and air blast from blasting activities.

An assessment of potential vibration impacts has been undertaken (refer Attachment 7) to identify recommended blast parameters to be implemented at the project to control vibration within approved and acceptable levels. The blasting assessment process is conducted using industry standards, industry rules and blasting experience to evaluate multiple blasting scenarios. Each scenario was evaluated to determine if the specific scenario complies with anticipated licence conditions and minimises disturbance to the neighbouring properties. The closest properties were identified and the distance measured from the proposed extraction limit boundary to the closest residential property. A single set of site blast data from the Petersons Quarry was supplied and was used as a guide along with AS2187.2-2006 to determine the potential blast vibration, airblast overpressure and flyrock projection.

The ANZECC guidelines state that in relation to airblast 100% of blasts must be less than 120 dBL and 95% of the blasts must be less than 115 dBL, which reflects the requirements of AS2187.2-2006. Whereas, in relation to ground vibration the maximum level is to be 10mm/s and 95% of blast must be less than 5mm/s. The nearest sensitive receptor to the proposed blasting activities for the project is 140 Newmans Road, Coraki (Lot 4 DP6339) located 335m from the northernmost extraction limit. The assessment identified the following recommendations to ensure blasting for the project complies with the adopted blast criteria:

- Establish permanent blast monitoring locations at the two closest neighbouring properties, which are 140 Newmans Road (Lot 4 DP6339) and 200 Lagoon Road (Lot 12 DP6339), Coraki.
- Start developing a blast vibration equation, specific to the Coraki Quarry. A suitably qualified person should be involved in this process, as using incorrect techniques can add additional cost to blast vibration control;
- Commence blasting using a maximum of a 12 m bench height and 89 mm blast holes to ensure compliance with airblast overpressure and blast vibration. After 3 blasts, the results can be reviewed and evaluated as to whether 102 mm blast holes should be implemented. The airblast overpressure and blast vibration compliance must be maintained;
- Establish the recommended Blast Exclusion Zones (BEZ). If required measure the flyrock projection distances from the first 10 blasts and recalibrate the flyrock equations. This will enable optimisation of the BEZ distance. Due to the use of a conservative value for the constant K in the prediction equations it would be expected that the exclusion distance could be reduced, however this must not be taken for granted;
- All blasts must be face profiled, surveyed and bore tracked to ensure airblast overpressure compliance, combined with the ability to control face burst that can cause flyrock incidents;
- Blast volumes should be maximised to reduce the frequency of disturbances to the neighbouring properties. A target blast volume of 18,750m^3 and 15 tonnes of bulk explosive load is recommended. Shot sizes should be limited to a maximum of 3 rows deep initially, to minimise vibration reinforcement if utilising a non-electric initiation

system. Once actual blast vibration data has been collected and analysed shot sizes may be increased, if the data supports increasing the blast Maximum Instantaneous Charge (MIC) and remaining under 5mm/s;
- Orientate blasts with free faces not directly facing the sensitive receivers, to assist with airblast overpressure control;
- Initiation sequencing for initial blasts, should target no more than a single blast hole MIC of 88kg until the vibration attenuation can be accurately assessed.
- All proposed parameters are for initial blasting at the site. Once actual blast data is available from blasting at the proposed site, then parameters may be optimised using the analysis techniques outlined in this document. Site specific constant (k value) will require calibration for flyrock, blast vibration and airblast overpressure.

The assessment concludes that the project does not introduce any significant risks or impacts to surrounding properties and that blasting at the project is expected to comply with the anticipated licence requirements and ANZECC guidelines subject to the implementation of the above recommendations.

In relation to potential cumulative impacts of blasting for both the Petersons Quarry and the project, as previously discussed, for the duration of the project the Petersons Quarry will adopt the more stringent environmental requirements anticipated to be imposed for the project. The resource assessment prepared for the project determined that the resource is consistent in quality and structure in both the Petersons Quarry and on Lot 401. Accordingly, the same blast parameters and recommendations discussed above can be implemented for the life of the project. To minimise project costs and maximise material delivery efficiencies the drilling and blasting programs at Petersons Quarry and the project will be coordinated and operated as a single project increasing the effectiveness of safety procedures for blasting.

7.7.2 Blast fume management

As discussed above, Quarry Solutions is committed to applying modern blasting technology to the quarry operation including blast fume management and controls. Blast fumes are the gases generated throughout the chemical reaction of initiation of explosives. Some of the gases are toxic and some of the gases are not. Those gases that can be of risk to health are:

- Oxides of Nitrogen (NOX)
- Nitrogen Oxide (NO2)
- Nitric Oxide (NO).

Nitrogen Oxide is the plume seen from a blast, this is generally a red / orange colour, this can also be attributed to over gassing the explosive or having an influx of diesel in the mix of Ammonium Nitrate fuel oil (ANFO) or ANFO/Emulsion products. The main risk to health is that of lung inflammation or (pulmonary oedema) which can take effect several hours after the blasting event. Other health effects may include:

- Dizziness
- Headache
- Eye, nose and throat irritation
- Shortness of breath
- Wheezing or exacerbation of asthma.

The potential for impacts from blast fumes during blasting is considered by the drill and blast contractor in the preparation of the blast management plan prepared for each blast. Potential impacts can be avoided through implementation of typical management measures such as:

- Blast Exclusion Zone – If blasting in conditions that may be expected to produce fume then the Blast Exclusion Zone should account for the potential to produce fume. The Blast Exclusion Zone risk assessment must address the potential to produce fume and have in place a procedure that if unfavourable wind direction, with a higher potential to produce blast fume or dust the blast will only be fired with favourable wind directions; and
- Blasting procedure / Blast Design Procedure – This procedure must address product selection, with reference to hole conditions e.g. wet hole product only used in wet or damp hole, not ANFO. Low density products used in

softer wet ground condition to ensure more favourable detonation of explosives, e.g. 1.0 density in clay overburden, increases sensitivity of the product.

- Inspection delay – It is important that all staff and visitors abide by all blasting safety procedures, which typically include a mandatory delay of five (5) minutes from the time of initiation before anyone is to enter the blast zone to inspect for misfires. This 5 minute period is to be adhered to for non-electric and electronic initiation blasts taking place. Adhering to this procedure will dramatically reduce any risk of persons being affected by blast fumes associated with blasting.

On the basis that Quarry Solutions is committed to applying modern blasting technology and practices under the supervision of suitably qualified drill and blast contractors potential for blast fume impacts are considered to be low and can be managed by well-known and typical practices employed by the industry.

7.7.3 Monitoring

Drilling and blasting on the site will be undertaken in accordance with the relevant conditions of approval once issued. At least one calibrated and approved monitor with geophone and microphone will measure the air over pressure and vibration of each blast that is initiated onsite. Monitoring must be undertaken by a suitably qualified person in accordance with Australia Standard 2187.2 – Explosives Storage, Transport and Use – Part 2 use of Explosives and include:

- peak particle velocity (mm/s)
- air blast overpressure level (dB linear peak)
- location of the blasting within the site
- atmospheric conditions including temperature, relative humidity, wind speed and direction
- affects due to extraneous factors
- location, date and time of measurements.

The vibration monitoring system will consist of a series of individual monitors which will be positioned at specified locations around the quarry and covering the nearest of the potentially sensitive receptors adjacent to the site. Each vibration monitor will have four recording channels. An external geophone (transducer) will monitor ground vibration in three directions (transverse, vertical and longitudinal particle velocities) and report the level in mm/s. An external microphone will measure the level of overpressure, reporting the data in units of dBL. The monitors will be configured with a vibration threshold trigger to record blast events which exceed a minimum value, typically around 0.3mm/s. The recording duration will be set to exceed the duration of the blast.

Monitoring locations for blasting will be identified prior to each blast. In the event that additional monitoring sites are required, these will be confirmed by the Quarry Manager. Blast monitoring will be undertaken in accordance with AS 2187.2 - 2006.

Vibration and air overpressure monitoring will be controlled/completed by the contractor. The contractor will provide the necessary equipment and personnel and/or procedures to deploy, upload and forward the measured blast data through and undertake any necessary subsequent analyses and distribution to Quarry Solutions. Blast data from the contractor will be made available after each blast for analysis, comment and close out. This data will be provided to the relevant authorities upon request and will be kept for a period of five years.

7.8 Surface Water

An assessment of potential surface water impacts and measures required to manage potential impacts from the project has been undertaken (refer Attachment 8).

7.8.1 Site description

Flow from the site discharges into Seelems Creek which has a catchment in excess of 800ha predominately comprising agricultural land. Seelems Creek discharges into the Richmond River approximately 6km downstream from the site. The site consists of mainly open grassland with minor patchy scrub towards to lower elevations on the site.

7.8.2 Target environmental values

The existing Petersons Quarry is operated pursuant to EPL 3397. However, EPL 3397 does not provide specific water quality limits and monitoring requirements due to the age of the approval.

Accordingly, the assessment considered the physio-chemical indicators and numerical criteria (trigger values) for uncontrolled streams within the Richmond Richer Catchment in the setting of the target environmental values that are to be achieved for any water releases from the project, described below in Table 22.

Table 22 Physio-chemical indicators and numerical criteria

Total Nitrogen (N) (mg/L)	Total P (mg/L)	DO (%sat)		Turbidity (NTU)	pH		Conductivity (ms/cm)
		Lower	Upper		Lower	Upper	
350	25	85	110	6-50	6.5	8.5	125-2200

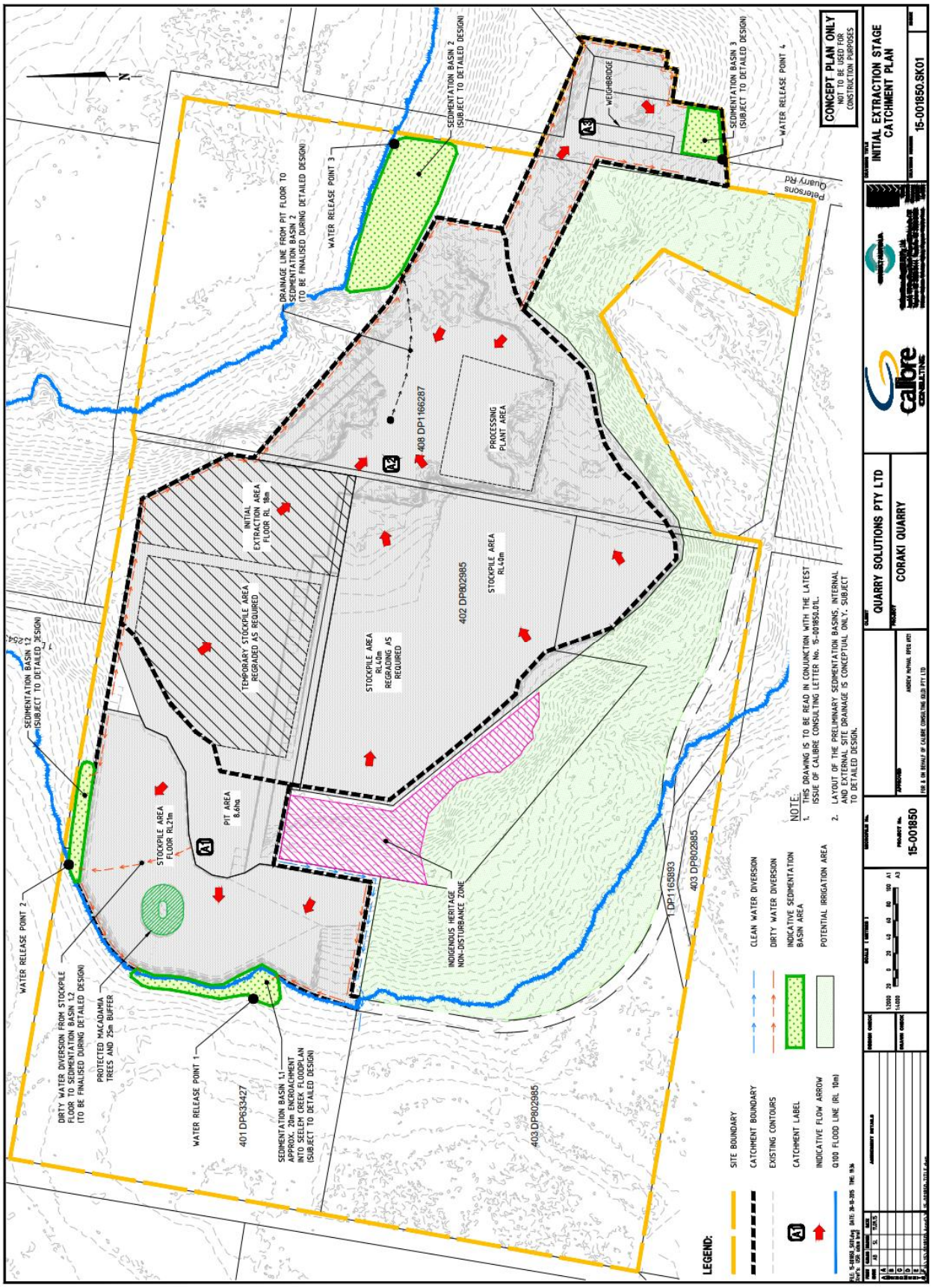
7.8.3 Surface water quality impacts

A surface water management strategy is outlined in Section 2.2 of Attachment 8.

The on-site surface water management strategy involves a system of dirty water collection drains that convey surface water runoff to respective sedimentation basins. A total of 3 sedimentation basins are proposed for the project including the existing Petersons Quarry within the overall surface water management system for the project (as per the conceptual surface water management sketch in Attachment A of Attachment 8) and shown below in Figure 31 thereby addressing potential cumulative impacts of the combined disturbance areas.

The sedimentation basins have been sized in accordance with Managing Urban Stormwater Soils and Construction: Volume 1 (Blue Book) and Volume 2E (Mines & Quarries). The sedimentation basins have been sized to capture the 90 percentile 5 day rainfall event for their respective catchments.

Figure 31 Surface water management plan



The sedimentation basins will provide stormwater quality polishing and treatment for the frequent rainfall events for on-site stormwater runoff. The sedimentation basins are expected to discharge during intense or extended rainfall events (further discussed in Section 2.3 of Attachment 8). It is anticipated that any overflows from the sedimentation basins will coincide with flows within the Seelems Creek catchment. Some testing of on-site water was undertaken by Groundworks Plus. The testing was sampled from the existing on-site pond and another area of standing water in the pit. The results of the testing are provided below in Table 23.

Table 23 Physio-chemical indicators from on-site sampling

Location	DO (%sat)	Turbidity (NTU)	pH	Conductivity (ms/cm)
Pit	6.3	75	8.8	490
Pond	6.4	100	7.6	930

The water quality testing undertaken on site indicates that some indicators are in excess of the trigger values in Table. The adopted management strategy includes minimal uncontrolled discharges plus controlled discharges with TSS less than 50mg/L after rainfall events. It is further noted that the sediment basis will be discharged via sheet flow to open grass land prior to entering any nearby water bodies.

7.8.4 Surface water quantity impacts

The sedimentation basins will not need to comply with the harvestable rights dam maximum on the basis that they will be required for treatment of sediment laden water and the EPA under the Environmental Protection License will include a condition which will require treatment of sediment laden water prior to release.

From the water balance analysis in Section 2.3 of Attachment 8, the average yearly overflow and controlled discharges from Sedimentation Basin 2 into the receiving environment during the final extraction stage is approximately 141,590 m3/year. From the contributing catchment to Sedimentation Basin 2 in the existing scenario (a volumetric runoff coefficient of 0.48), the average runoff from the catchment is approximately 180,195 m3/year. With losses (evaporation and on-site reuse), there will be a reduction in stormwater runoff from the site.

The site is located adjacent to Seelems Creek. Seelems creek discharges into the Richmond River approximately 6km downstream of the site, south of the township of Coraki. Refer to Attachment F of Attachment 8 for the waterways adjacent to the site. The quarry and associated infrastructure will be above the 100 year ARI flood level (10m AHD). Sedimentation Basin 1.1 extends approximately 20m into the Seelems Creek floodplain fringe of an extensive floodplain (approximately 1,600 m wide) on the western site boundary. It is anticipated that this may have impacts on flood levels in the immediate vicinity of the basin only. The basin will be designed so that the impact on the floodplain is minimised. As there is no external infrastructure adjacent to, or upstream of Sedimentation Basin 1.1, any minor impact that the basin may have on flood levels is not likely to affect any properties.

With the proposed surface water management strategy, there will be no significant impact on water quality and quantity as a result of the development.

7.8.5 Soil and water management plan

During the construction and operational phase of the quarry development, a large amount of soil has the potential to be eroded and deposited onto nearby lands or downstream receiving environments. To minimise that potential impacts of land disturbances from the development, a Soil and Water Management Plan has been prepared based on Managing Urban Stormwater Soils and Construction: Volume 1 (Blue Book) and Volume 2E (Mines & Quarries).

7.8.6 Sizing of sediment basins

All on-site sedimentation basins have been sized in accordance with the guidelines set out in Managing Urban Stormwater Soils and Construction: Volume 1 (Blue Book) and Volume 2E (Mines & Quarries). In the absence of site specific soil data, information on the likely soil type has been sourced from the Lismore-Ballina Soil Landscape section of the Blue Book (Appendix C – Table C2) for Coraki (Ck). Conservatively, the assessment undertaken in Attachment 8 adopted a soil type for the project as 'Type F' (bulk of soil is fine grained with 33% finer than 0.02mm). The total volume of a 'Type F' sediment basin is the sum of the following two components:

- A settling zone, within which water is stored allowing the settlement of suspended sediment, and
- A sediment storage zone, where deposited sediment is stored until the basin is cleaned out.

The settling zone volume is determined from the 90th percentile, 5 day rainfall event as per Table 6.1 in the Mines and Quarries book. This is the minimum design requirement for a 'Type F' sedimentation basin for quarries with a disturbance duration greater 3 years.

As outlined in the water balance modelling in Section 2.3 of Attachment 8, the sedimentation basins designed for the 90th percentile, 5 day rainfall event overflow with a higher frequency than that outline in Table 6.2 in Volume 2E of the Mines and Quarries manual. An additional 2 water balance modelling scenarios (Scenarios 3 and 4) were investigated where the design rainfall event was increased to the 95th percentile, 5 day event.

The design rainfall depth has been taken from the closest site rainfall depth chart in the Blue Book (Table 6.3a). The Lismore (058037) 90th percentile, 5 day rainfall depth is 60.2 mm and the 95th percentile, 5 day rainfall depth is 95.3 mm. The volumetric runoff coefficient (Cv) adopted for the site was 0.74. This value is higher than that recommended in Table F3 (Appendix F of the Blue Book) for the expected soil type at Coraki for disturbed sites (upper limit Cv for Coraki of 0.48). The adopted Cv is reflective of the disturbance activity (quarrying) and the type of quarry material which will result in a high runoff potential from the site. Contributing catchment areas to each sedimentation basin are provided in Attachment A of Attachment 8 for both the initial and final extraction stages. The sediment storage zone is taken as either the:

- 50% of the settling zone capacity, or
- Two months soil loss as calculated with the Revised Universal Soil Loss Equation (RUSLE).

It was found that 50% of the settling zone capacity yields a larger storage volume for each sedimentation basin and was therefore adopted for calculating the total sediment storage volume. Clear water diversion bunds are to be located near the western site boundary to divert clean water around the site. This clean water diversion helps to minimise the required onsite sediment basin size. Refer to Attachment B of Attachment 8 for sediment basin volume calculations for individual catchments. The final sedimentation basin volumes are subject to detailed design of the development.

7.8.7 Site water balance

A detailed site water balance was undertaken to assess the overall site surface water management system and to quantify the volume and frequency of discharges from the site. Daily rainfall data was extracted from the Bureau of Meteorology's website for Coraki (Union Street rain gauge – 058015). The station has daily rainfall readings from 1895 to 2015. The mean rainfall for Coraki is 1263 mm/year. Evaporation data was extracted from the nearest pan evaporation gauge at the Alstonville Fruit Research Station (058131), approximately 20km away from the site. Four scenarios were investigated for the site water balance:

- Scenario 1 - Sedimentation basins sized to capture the 90th percentile, 5 day rainfall event (the minimum required rainfall depth specified in Section 2.2.2)
- Scenario 2 - Sedimentation basins sized to capture the 90th percentile, 5 day rainfall event (the minimum required rainfall depth specified in Section 2.2.2) and increasing site water reuse to reduce outflow event frequency and volumes
- Scenario 3 - Sedimentation basins sized to capture the 95th percentile, 5 day rainfall event (above the required rainfall depth specified in Section 2.2.2)
- Scenario 4 - Sedimentation basins sized to capture the 95th percentile, 5 day rainfall event (above the required rainfall depth specified in Section 2.2.2) and increasing site water reuse to reduce outflow event frequency and volumes

Scenario 4 was adopted following analysis. Refer to Attachment E of Attachment 8 for detailed calculations from the site water balance modelling. Each scenario has a dust suppression rate of 2 l/m2/hour. This dust suppression rate was applied to all roads within the site. The quarry is expected to operate 6 days a week for 13 hours per day. Total road length has been delineated for both the initial and final extraction stage. For scenario 2 and 4, an additional external irrigation area was identified. This potential irrigation area is identified in Attachment A. An irrigation rate of 4

l/m2/hour was estimated. It is proposed to operate the external irrigation system for the same duration as the operation of the quarry. The area identified is approximately 18.25 ha. Irrigation water is supplied from Sedimentation Basins 1, 2 and 3.

The water balance includes dosing and discharge of treated water. It is assumed that immediately after a rain event in each scenario, the basins will be dosed (with an appropriate dosing agent). After 4 days of residence time, the basin is lowered (either by gravity or pump) to allow the 90th percentile, 5 day storm volume to remain free in each basin. If a rain event occurs within the 4 day period after dosing, the water will not be released until further dosing is completed following the subsequent rainfall event. Remaining water in the sediment storage zone may be used for on-site dust suppression. As per Table 6.2 in Volume 2E of the Mines and Quarries manual, the indicative average annual sediment basin overflow frequency is 2 to 4 spills per year. For Scenario 4 the average number of overflow events is 2 times per year. This is equivalent to the spill frequency identified within the Managing Urban Stormwater Soils and Construction: Volume 2E (Mines & Quarries). Overflows from the sedimentation basins are, on average, preceded by a 5 day rainfall total of 153.9mm.

7.8.8 Monitoring

The stormwater controls nominated will require regular monitoring and review to ensure that performance accords with design criteria and also reflects the dynamic nature and changing needs of the operation.

Monitoring of surface water or groundwater will be undertaken in accordance with the Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DECCW, 2004). The Quarry Manager shall carry out monthly surveillance of on site water storages and treatment systems. Inspection of site water storages and treatment systems shall also be carried out by the Quarry Manager immediately prior to anticipated runoff-producing rainfall and as soon as practicable following the event. Monitoring will consist primarily of visual inspection of the site, particularly with regards to erosion control structures during storm events and/or extended periods of heavy rain. Observations of the performance of the various components of the system will be made and ameliorative action taken to rectify underperformance. The Quarry Manager may engage the services of a suitably qualified person to conduct any water quality sampling and review monitoring results required to provide advice in relation to the water quality management if a complaint is received or requested by the administering authority. A summary schedule of the various inspections, performance criteria and responses that shall be performed on-site is shown in Table 2 – Action Plan for the Surveillance and Maintenance of Stormwater Control Devices of Attachment 2 and shown below for ease of reference.

Inspection	Minimum Frequency	Performance Criteria	Response
Inspect drainage lines including catch drains, contour drains and diversions	Quarterly	· erosion in areas adjacent to water conveyancing structures · overtopping of water conveyancing structures (identified by the scouring of the drain batters perpendicular to the direction of flow)	· eroded areas shall be treated appropriately (e.g. rock lined) as soon as practicable · drains to be cleaned of sediments and retreated as necessary to original design specifications · revegetation with grasses in the catchment of the drain may be required to reduce sediment loadings of runoff
Inspect potential sediment storage capacity of grit traps, sediment traps and excavation pit	Quarterly or following major rainfall events	· storage capacity maintained	· sediment to be removed from the structure and reused on site where possible · recycle sediment basin waters to ensure adequate free storage is maintained for the collection and holding of runoff
Waste containers	Quarterly	· waste to be stored in appropriate containers	· Ensure waste materials are stored and disposed of properly
Spill response stations	Quarterly and following use	· equipment to be properly maintained and stocked	· maintain equipment · replace / restock equipment as necessary
Maintenance / refuelling area	Quarterly	· fuel, oil spills · contractor maintenance · fuel storage integrity maintained	· clean up spills and the investigate spill source · maintain contractor maintenance records · investigate and repair potential leaks

7.9 Groundwater

The Petersons Quarry has been in operation since 1916 and has established a pit floor at RL 18m AHD. Resource investigations conducted in 2015 including percussion drilling of 12 holes and diamond core drilling of 5 holes (refer Attachment 9) did not encounter groundwater despite penetrating through the basalt resource into the underlying clay and sandstone layers. There is no evidence of groundwater seepage into the Petersons Quarry pit. There is also no evidence to indicate past quarry operations have encountered groundwater seepage into the Petersons Quarry pit.

It is anticipated that any local groundwater table is contained within the underlying clay and sandstone layers. It is proposed to limit the extraction depth on Lot 401 to retain a floor of basalt separating the project operations from those layers. This is consistent with the approach adopted for the Petersons Quarry which, as discussed above, shows no evidence of groundwater intrusion. Accordingly, it is considered unlikely that the project will encounter or impact upon groundwater individually or on a cumulative basis with Petersons Quarry.

Whilst it is unlikely that the project will encounter or impact upon groundwater, ongoing surface water monitoring in accordance with the anticipated requirements of the EPL for the project will serve to indicate any potential for impact through changes to water quality results. If it is suspected that the project is encountering groundwater based on observation of groundwater inflow or water quality monitoring results a hydrological investigation would be undertaken.

7.10 Visual Amenity

The project is located in a predominately rural setting. The rural landscape has been largely cleared of vegetation. The surrounding rural land utilised primarily for cattle grazing is considered to provide vistas of moderate scenic quality. The Petersons Quarry has been in operation since 1916 and is part of the landscape.

The Petersons Quarry has been developed in a manner which retains the leading edge of Spring Hill to screen the operations of the quarry from the surrounding area to the greatest practicable extent. The project has been designed to extract the resource from Lot 401 in the same manner has adopted by the Petersons Quarry. Spring Hill is limited in elevation and well established mature trees are located on its lower slopes providing a screen to operations being conducted on the upper elevations of the hill. An industrial facility is located immediately to the South of the project and is visible from Lagoon Road and Seelems Road.

The potential impact of the project on the visual amenity of the surrounding land is informed by the assessment of views from 6 representative locations around the project as shown below in Figure 32 Visual assessment and Plate 12 to 17 below. The only change between the initial and final extraction stage is the extent of the pit on Lot 401 which is shielded by the leading edge of the hill. Accordingly, there is no need to consider visual amenity impacts for each stage.

The project is located directly adjacent to and including land associated with the Petersons Quarry. The proposed extraction area for the project has been designed to extend from the existing Petersons Quarry pit to maximise topographical screening as a design measure to mitigate potential noise, dust and visual impacts. Stockpiling will occur in elevated locations on the top of Spring Hill associated with the Petersons Quarry and also the western portion of Lot 401. Elevated areas of Spring Hill are currently used for stockpiling for the existing Petersons Quarry. As such, for the life of the project it will appear as a single operating quarry when viewed from the surrounding landscape with the extraction, stockpiling and processing for the Petersons Quarry and the project occurring in tandem.

As the hours of operation will be restricted to 6am to 7pm Monday to Saturday no extended night works are proposed and therefore lighting impacts outside of operating hours are likely to be limited to the minimum necessary for security lighting. Accordingly, between 10pm and 6am it is anticipated that artificial lighting within the overall site will be directed and shielded to achieve compliance with the parameters for the control of obtrusive light given in Table 2.1 of Australian Standard AS 4282 (1997) Control of Obtrusive Effects of Outdoor Lighting.

Figure 32 Visual assessment

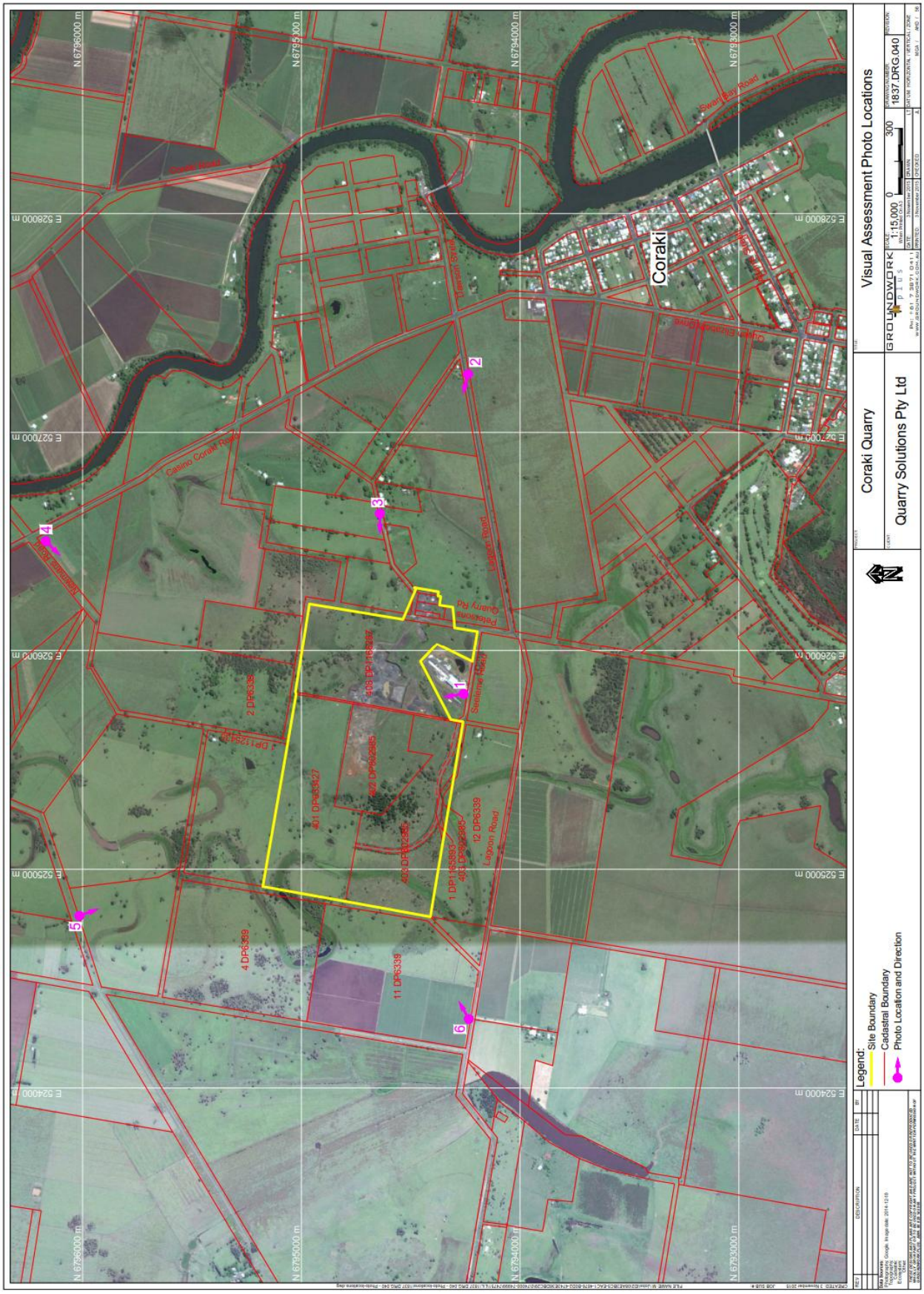


Plate 12 Location 1 Seelems Road

As shown in Plate 12 above, the visual amenity of Seelems Road is impacted by the existing industrial facility. Existing vegetation on the slope of the hill will be retained and provide a screen to the stockpiling area proposed to be establish on the top of the hill. Stockpiling activities will be further screened from view by the proposed earthen noise bunds ('screen 2' described in Attachment 6) to be established along the crest of the hill behind the existing vegetation. Accordingly, only limited views of the project will be afforded from Seelems Road.

Plate 13 Location 2 Lagoon Road (east)

As shown in Plate 13 views of the project are not available from Lagoon Road due to the intervening hill immediately to the east of the where the weighbridge and site office will be located.

Plate 14 Location 3 Spring Hill Road

Plate 14 above is taken from the road reserve of Spring Hill Road and shows the visibility of the existing Petersons Quarry which include a small area of the active pit and also stockpiling occurring on the cleared plateau of the hill. Visibility is partially screened by intervening vegetation which is to be retained. Lot 401 can currently be seen as a cleared grassy plateau of the hill. This area will also be used for stockpiling in the initial stages of the project. However, the proposed earthen noise bunds ('screen 6' described in Attachment 6) will be established on the crest of the hill and screen the areas to be utilised for stockpiling and extraction within Lot 401. Plate 15 below is taken from the road reserve of Newmans Road to the north east of the site. The cleared grassy plateau on Lot 401 can be seen but is partially screened by the existing vegetation on the lower slope of the hill which will not be impacted by the project. Visibility of the project within Lot 401 will be further diminished by the proposed earthen noise bunds ('screen 1', 4 and 6 as described in Attachment 6).

Plate 15 Location 4 Newmans Road

Plate 16 Location 5 Reynolds Road

Plate 16 above is taken from the road reserve of Reynolds Road to the north west of the site. The detached house on Lot 4 DP6339 is visible in the left of the image. The cleared grass slope of the western slope of Lot 401 and the top of the plateau can be seen in Plate 16 which corresponds to the proposed stockpile area located on Lot 401. Views of the proposed stockpile area would be minimised through the proposed earthen noise bund ('screen 1' as described in Attachment 6.

Plate 17 Location 6 Lagoon Road (west)

Plate 17 above is taken from the road reserve of Lagoon Road to the west of the site. The existing vegetation on the western slope of Lot 402 DP802985 can be seen. This vegetation is to be retained and will assist in screening the

project from the west. The western slope of Lot 401 is visible from this location which corresponds with the western stockpiling area. Whilst this area will be visible it is relatively low in elevation and will only impact on a limited extent of the views from this location. The southern most portion of the proposed stockpiling area on Lot 402 DP802985 will be visible from this location as the density of the existing vegetation is less in that area. However, the proposed earthen noise bund ('screen 2' described in Attachment 6) will minimise the visibility of that area.

Accordingly, based on the above representative locations it is considered that the visual impacts of the project are low due to the design of the extraction area as an extension of the existing Petersons Quarry pit and screening provided by existing vegetation on site and surrounding land which will not be impacted by the project.

It is also noted that the life time of a typical quarry is greater than 30 years and therefore any visual impacts remain in the landscape for an extended period of time. In comparison the project life of only 7 years is short and will see any residual visual amenity impacts resolved in a shorter time period than what would ordinarily be experienced for a typical quarry.

7.11 Rehabilitation

Rehabilitation is an essential component of quarry planning and development. Good planning prior to the commencement of quarrying greatly assists in the management of environmental impacts and provides for efficient operations.

A review of the rehabilitation obligations for the Petersons Quarry was undertaken as part of the preparation of the EIS and it was identified that the consent and EPL outline limited requirements for rehabilitation due to the age of the approvals. It has also be noted that after the life of the project a substantial amount of resource will remain within Petersons Quarry and it is anticipated that it will continue for an extended time period beyond the life of this project. Accordingly, for the purposes of this project, rehabilitation should be considered separately to the future rehabilitation obligations of Petersons Quarry.

A detailed rehabilitation management plan has been prepared as part of the EMP (refer Attachment 2). The rehabilitation management plan has been prepared to guide planning, landforming, revegetation, maintenance and environmental management associated with land disturbed by extraction activities at the site. Extractive industry is a temporary land use. Designing and implementation of rehabilitation works is therefore an important element of an extractive industry. Integration of rehabilitation and extractive operations assists in cost control as well as minimising potential environmental impacts. Potential impacts resulting from extractive industry include:

- Soil erosion
- Pollution of storm water run off
- Sedimentation of waterways
- Increased nutrient loads in waterways
- Introduction of weed species
- Potential clearing of vegetation
- Potential loss of habitat and biodiversity.

The rehabilitation management plan is relevant only to Lot 401, as the existing Petersons Quarry will remain as an operational quarry. It is also noted that the access road on Lot 403 DP 802985 will remain as an access road to Lot 401 and will not require rehabilitation.

The program for implementing rehabilitation works for quarries primarily depends on the rate at which terminal benches are reached. As the expected operating life of the project is only five (5) to seven (7) years (subject to the duration of the upgrade works to the Pacific Highway), rehabilitation works will not be undertaken until terminal benches and floors are reached within Lot 401 and the resource is exhausted. As previously identified the existing Petersons Quarry will continue operation beyond the life of the project. Therefore land associated with the Petersons Quarry shall not be rehabilitated at the completion of the project. Accordingly, rehabilitation will be limited to disturbed areas on Lot 401 only and not include benches and other disturbed areas within Petersons Quarry.

Significant rehabilitation work is not anticipated at the end of the project because the processing plant, weighbridge, site office, workshop and other activities are located outside Lot 401 and within land associated with the existing Petersons Quarry. Therefore actions such as removal of surface infrastructure, workshops and other buildings and services will not be required. It is noted that as the overburden depth is shallow, the project will not result in large overburden dumps. Overburden will be utilised on site for establishment of stormwater controls, stockpile pads and potentially blended with the high quality basalt resource during the crushing and screening process to create saleable product.

Lot 401 has been historically used for grazing. The final rehabilitated land form shall be compatible with the historical land use (e.g. grazing) in the short term, resulting in pasture grasses over large flat floors which will be suitable for long term redevelopment options, potentially for industrial uses, subject to further strategic planning by Richmond Valley Council. Accordingly, it is considered that the final landform should comprise of grassed gently sloping free draining platforms with any remaining sediment basins converted into a water reservoir for stock watering purposes. Rehabilitation management measures are included in the EMP.

This final landform is consistent with the key principles of the *Strategic Framework for Mine Closure* as it:

- Provides a safe, stable and self-sustaining final landform compatible with the intended final land use;
- Reduces the need for long term monitoring and maintenance by achieving a rehabilitation outcome that will be quickly established and completed after the project ceases;
- Achieves a sustainable plant cover which will protect against potential sediment and erosion impacts; and
- Does not prevent the continued operation of the Petersons Quarry.

Preliminary closure and rehabilitation completion criteria for the project should include the following:

- Rehabilitation areas are free of any contamination and hazardous materials, grassed and sediment basins converted into stock watering dams;
- Terminal faces are assessed by a suitably qualified expert as being safe and stable;
- Runoff water quality from the site does not pose a threat to downstream water quality and there is no evidence of erosion from rehabilitation areas; and
- There are no significant weed infestations.

The following performance targets and completion criteria will be adopted:

- Return the site to a safe, stable, non-polluting state, suitable for reinstatement of previous land use (i.e. rural – cattle grazing).
- Maintain the general amenity (visual, air quality, water quality, etc.) of the surrounding area.
- Prevent the degradation of non-operational areas.
- Limit land disturbance to that which is necessary at any one time.
- Identify any land contamination and implement appropriate remediation or management where necessary.
- Ensure progressive rehabilitation is carried out during the progression of quarry activities where practicable and commence progressive rehabilitation as areas become available.
- Select suitable plant species for revegetation.
- Reinstate stable drainage patterns.
- Prevent the introduction or spread of declared weeds and pest species.

Strategies and mitigation measures to achieve the performance targets include the following.

Rehabilitation Staging

The staging of the rehabilitation works will follow the sequence of quarry development as terminal benches are reached. The terminal benches on the southern side of Lot 401 will ultimately be subsumed by the eastwards extension of the Petersons Quarry on Lot 402 DP802985 hence will not require rehabilitation. There will remain a wall, but no benches, on the northern side of Lot 401, hence no benches in this area of the quarry requiring rehabilitation. The western

benches of Lot 401 represent the western edge of development which will be achieved at the end of the life of the project. These benches will therefore be rehabilitated at the end of the Project life.

Final Land Use

The following measures shall ensure that the landform created by extraction activities is stable and is connected into the surrounding landscape:

- Using earthmoving equipment to progressively shape and trim the workings to the desired design profiles and flattening the gradients of selective batters to a stable angle of repose on reaching the terminal limits of extraction.
- Rounding or marrying the contours into the natural ground surface.
- Scaling down loose rock.
- Topsoiling and grassing of contours.
- Providing access to the terminal workings to allow maintenance of rehabilitation works.
- Designing landform and drainage to control erosion for the particular hydrological regime.
- Where necessary, planting media should be spread and shaped over selected rock faces and topsoiled to assist in retaining precipitation and controlling sediment movement.

Terminal quarry benches shall be battered to varying slopes depending on the geotechnical properties of the substrate.

Once quarry operations are completed, the extraction floor will be contoured to a gentle grade to establish a free draining platform. The area will be covered in topsoil to a suitable depth and seeded with paddock grass species to return the land to its current use of cattle grazing.

The stock dam to be developed as a sediment dam on the western extremity of the site adjacent to the Indigenous Heritage Non-Disturbance Zone will remain after the cessation of the Project as a stock dam and not require rehabilitation.

Topsoil Management

Topsoil and any overburden / remaining extracted material on site will be used as part of the rehabilitation of the final landform. Topsoil supports and promotes plant growth, soil micro-organisms, organic matter and nutrients. Topsoil is defined as the organic rich, friable layer beneath the natural ground surface. The physical properties of topsoil are important for promoting and supporting plant growth. The following measures should be implemented for topsoil stripping:

- Topsoil should not be stripped when it is too wet or too dry.
- Topsoil when stripped should be used directly for rehabilitation to the maximum practicable extent, or stockpiled and preserved for future use.
- Stockpiling of topsoil should not exceed a height of 2 to 3 m and should be shaped (i.e. batters no greater than 2:1) and revegetated to protect the soil from erosion and weed infestation.
- Stockpiles should be maintained in a free draining condition and long-term soil saturation should be avoided.
- Runoff waters external to the areas to be stripped should be diverted away from the working area.
- Stripping of topsoil should be limited to the minimum area necessary.

The following measures should be implemented for topsoil spreading:

- Whenever possible, stripped topsoil should be directly placed on an area undergoing rehabilitation.
- Areas to be topsoiled should be re-shaped prior to placing topsoil.
- Equipment used to spread topsoil should be scheduled to avoid compaction.
- Before respreading the topsoil, loosen the subsoil to break up any compacted or surface sealing and to enable keying of the two (2) soils.
- On slopes less than 3:1, loosen lightly compacted subsoil with a tined implement ensuring all ripping operations occur along the contour.
- Topsoil is to be removed from stockpiles in a manner that avoids vehicles travelling over the stockpiles.

- Topsoil is to be respread in the reverse sequence to its removal so that the original upper soil layer is returned to the surface to re-establish the entrapped seed content of the soil.
- Ensure all exposed subsoils are covered.
- Topsoil is to be respread over selected batters, contours, bunds and disturbed areas to a minimum thickness of 100 mm.
- After spreading topsoil, ensure the surface is left in a roughened state to assist moisture infiltration and inhibit soil erosion.
- Prior to any planting, cultivate any compacted or crusted topsoil surfaces.
- Soil spreading is to be immediately followed by seeding or planting if applicable.
- Straw or organic mulch may be spread over the soil to minimise potential soil erosion until the area is revegetated.
- If erosion occurs on treated surfaces, the area is to be re-topsoiled and sown with cover grass.

Revegetation

There are a range of methods for establishing vegetation that may include; natural regeneration, hydro-mulching, seed broadcasting, seedling planting and direct seeding. Natural regeneration followed by seed broadcasting shall be the preferred method of establishing vegetation. All methods shall be accompanied by appropriate weed control to prevent rehabilitated areas from being overrun with weed species. The quarry floor and former stockpile areas will be revegetated using suitable pasture species in order to return the area to its current use of cattle grazing.

Weed and Pest Control

Any materials (e.g. earth, soil, mulch and straw) brought onto the site for rehabilitation shall be inspected to ensure the materials are free from weeds and pests. Prior to the establishment of vegetation, a spraying campaign may be required to control weeds to prevent migration of weed species into areas under rehabilitation. Alternative methods for controlling both grass and weeds include manual weeding, slashing, weed matting and mulching. Predation (e.g. grazing animals, birds, kangaroos, hares, and insects) are risks for revegetation. Depending on the situation, specific measures may be required to protect the works from predation such as fencing, barriers, etc.

Monitoring

Once rehabilitation commences, the Quarry Manager shall undertake a monitoring program to review the ongoing success of the rehabilitation treatment. Rehabilitation measures including landform stability, long-term sediment and erosion controls and revegetation of profiled final land surfaces will be visually monitored by the Quarry Manager and, where relevant, assessed by technical experts to determine the effectiveness of measures implemented. The Quarry Manager may engage a suitably qualified consultant to monitor the establishment of vegetation and land stability. The key parameters to be measured as part of the monitoring program will include:

- Erosion
- Groundcover
- Vegetation species (richness of desired species)
- Weed presence.

The Quarry Manager shall conduct regular inspections of any rehabilitated areas to ensure timely maintenance works are carried out as necessary. Maintenance works may include fertilising, watering, repairs to barriers, guards and plant failure replacements, refer to Table 24.

Table 24 Maintenance Schedule for Revegetation Works

Item	Activity	Frequency
Weed Control		
Site Preparation (where necessary)	Application of herbicide and / or slashing	One (1) treatment at least two (2) weeks prior to seeding / planting
Ongoing Weed Management	Application of herbicide	Suggested biannually or as required
Supplementary Weeding	Application of herbicide	As required

Item	Activity	Frequency
Revegetation Management	Monitor performance and conduct any necessary maintenance	· One month after seeding / seedling planting. · Three (3) months after seeding / seeding planting. · Six (6) months after seeding / seedling planting. · 12 months after seeding / seedling planting. OR · Following significant rainfall events (e.g. >25 mm).
	Replace diseased or dead plants	As necessary following maintenance inspections
	Fertilise (if applicable)	Two (2) months after topsoil spreading or seeding
	Apply mulch (if available)	One-off around plantings
Weed Control Site Preparation (where necessary)	Application of herbicide and / or slashing	One (1) treatment at least two (2) weeks prior to seeding / planting
Ongoing Weed Management	Application of herbicide	Suggested biannually or as required
Pasture Management		
Grass Height	Slashing	Biannually until established
Grass Vigour	Fertilise	Annually (if necessary)

7.12 Land Use, Land Forms and Agricultural Suitability

7.12.1 Land use

The site is located at Seelems Road and Petersons Quarry Road, Coraki NSW 2471, including Lot 401 and land associated with the existing Petersons Quarry. The site is located approximately 2.5 kilometres to the north-west of Coraki on the Far North Coast of New South Wales (NSW). Coraki has a population of approximately 2,000 people, situated approximately 720 kilometres north of Sydney and 240 kilometres south of Brisbane.

Land use directly adjacent to the site is rural in nature, predominantly consisting of cattle grazing. The land in the locality has been extensively cleared for grazing purposes. Several farm sheds are scattered on neighbouring properties. Residential development in the vicinity of the site is extremely sparse but includes a number of dwellings to the east on Spring Hill Road, Coraki and also a dwelling to the south on Lagoon Road. The closest residences to the proposed extraction area are located approximately 335 metres to the north, 820 metres to the east and 595 metres to the south of the extraction area. Lot 407 on DP1166287, south of the site, is an existing industrial operation.

Petersons Quarry, owned by Richmond Valley Council and forming part of the land for the project, has been in operation since 1916 supplying crushed basalt for road construction and for private sale. Quarrying operations have been undertaken in response to demand, with operations typically undertaken two (2) or three (3) days of the week. The Petersons Quarry is operated pursuant to Environment Protection Licence (EPL) 3397. The Petersons Quarry will continue operation for the duration of the project and after cessation of the project and rehabilitation of Lot 401.

Specialist assessments have considered the potential impacts to nearby sensitive receptors associated with noise, dust, vibration and traffic and have recommended project specific management measures. Accordingly, it is not anticipated that the project would have a significant detrimental impact on the rural activities conducted on surrounding land.

As identified in Section 7.11 the proposed post extraction land use of Lot 401 is the re-establishment of the historical use of cattle grazing. It is considered that this is the most logical post extraction land use given the proximity of Lot 401 to the Petersons Quarry which would continue operation for the foreseeable future. However, it is noted that the proposed quarry design would establish the pit floor at the same elevation as the existing Petersons Quarry floor ensuring that a large flat land form is established which could be easily adapted for industrial land uses subject to further strategic planning and analysis by Richmond Valley Council.

7.12.2 Land form

The site occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion, and includes the Lamington Volcanic Slopes, Grafton-Whiporie Basin and Clarence-Richmond Alluvial Plains Mitchell Landscapes.

The site is comprised of locally elevated land which rises above the adjacent floodplains and wetlands. Spring Hill is located in the western section of Lot 402, with a high point of approximately RL 47 m AHD. Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands. The topography of the surrounding area is predominantly low relief, flood prone, alluvial plains.

The Richmond River is located approximately 1.7 km to the east. Kennedys Swamp lies to the north and occupies the area north of the 5m contour line within Lot 408. Kennedys Swamp has an approximate catchment area of 200ha and is bounded by the Casino – Coraki Road to the east, Newmans Road to the north and Spring Hill to the south and west. Surface runoff from the eastern slopes of Spring Hill flow east into the existing quarry and are then directed north through a small sediment retention basin into Kennedys Swamp.

The topography of the site, which includes the Petersons Quarry has been modified since the commencement of the Petersons Quarry in 1916. The existing Petersons Quarry has resulted in two areas of extraction. Firstly, an early area of extraction within which the site office, weighbridge, staff and visitor carparking areas are located directly off Petersons Quarry Road. Secondly, the primary pit within Lot 408 DP1166287 which is also extending into Lot 402 DP802985.

The project will utilise the land associated with the existing Petersons Quarry to commence initial extraction into Lot 401 from the existing pit on Lot 408. This design takes advantage of the existing topographic buffers established by the Petersons Quarry. The project will proceed at the same depth as the existing Petersons Quarry so that the same pit floor level is established. Accordingly, the project is considered to be a logical progression of the existing extractive industry activities on the site and will result in a post extraction land use suitable for recommencement of the previous rural land use (cattle grazing).

7.12.3 Acid sulfate soils

The site is predominately mapped as containing Class 5 (lowest risk of containing acid sulfate soil (refer Figure 6 and Drawing No. 1837.DRG.021R1 Acid Sulfate Soil Mapping). The proposed extraction area is limited to the portion of the site mapped as Class 5. As previously noted the LEP states that, assessable development includes development on land mapped as 'Class 5', involving works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5m AHD and by which the water table is likely to be lowered below 1m AHD on adjacent Class 1, 2, 3 or 4 land. The proposed development is within 500 metres of land designated as 'Class 3' land, however, works will not occur below 5m AHD and the water table is not likely to be lowered as groundwater is not anticipated to be encountered. Resource investigations encountered no groundwater in the extraction area. It is anticipated that any groundwater resides within the underlying clay and sandstone layers, and as it is proposed to retain a floor of basalt, no interaction with groundwater is anticipated. In addition, based on discussions with Council, no groundwater has been intercepted by operations at the adjacent Petersons Quarry. As such, potential acid sulfate soils are not anticipated to be encountered by the project.

7.12.4 Northern Rivers Farmland Protection Project

The importance of agricultural land on the NSW North Coast has been recognised by the Northern Rivers Farmland Protection Project under which the portion of site comprising the basalt resource is mapped as 'Significant Non-Contiguous Regionally Significant Farmland' whereas the lower lying portions of the site are mapped as 'Other Rural Land'.

It is understood Regionally Significant Farmland has the following attributes:

1. Slope generally less than 15%.

2. Consists predominantly of any of the following soil types: Chocolate Soils, Euchrozems Krasnozems, Some Grey, Brown and Red Clays, Black Earths, Chernozems, and Prairie Soils. These soils are groups 4 and 5 in Table 8.2 from Murphy et al. (2000). They are soils of high fertility. Group 4 soils have a high level of fertility in their virgin state which is significantly reduced after only a few years of cultivation. Group 5 soils generally only require treatment with chemical fertilisers after several years of cultivation. Physically, Krasnozems are better than most soils but they have some undesirable chemical features. Australian Soil Classification equivalents are Dermosols, Ferrosols and Vertosols. The above soils are generally characterised by well-developed structure, high fertility and good drainage.
3. Soils are generally deeper than 1 metre.
4. Well drained landscape.
5. Rock outcrop less than 10%.
6. Flood free.
7. Not affected by other constraints/hazards either within the soil landscape or originating in adjoining soil landscapes (eg: run-on, mass movement, localised flooding).

It is considered that Spring Hill has been mapped incorrectly on the basis that whilst the site (including Petersons Quarry) has areas of slope of less than 15%, is flood free and well drained, it does not have soils deeper than 1m with significant rock outcropping and would not be suitable for farming. On this basis, it is considered that the project would not have a significant detrimental impact on the supply of regionally significant farm land.

7.13 Socio-economic

As previously outlined, during the preparation of this EIS, Quarry Solutions has actively engaged with surrounding land owners, residents and local businesses through a coordinated effort of letters and telephone calls followed by face to face meetings. Feedback received during those discussions were recorded by Quarry Solutions staff and was incorporated into the design of the development and proposed management measures. The engagement program was supported by a Community Briefing Paper which communicated key aspects of the project. The primary issue raised by the engagement program included management of the additional truck movements through Coraki.

This EIS includes a range of specialist reports to assess the potential impacts of the project, including those likely to impact upon the local community. The design of the project incorporates a range of mitigation and management measures to address those potential impacts and has been informed by the findings of the specialist reports. The findings of this EIS are that the project will not result in significant impacts to the community particularly when consideration is given to the purpose of the project to supply essential construction materials to the Pacific Highway upgrade project and for a limited time of only 7 years.

Quarry Solutions is committed to engaging with the local community and becoming a member of the local community over the long term. Quarry Solutions is an equal opportunity employer and the Coraki Quarry Project will create a number of new employment opportunities within Quarry Solutions for local residents which will be advertised locally and on-line at the Quarry Solutions website. It is important to note that the employment opportunities will include a range of traineeships for school leavers, and Quarry Solutions looks forward to assisting the next generation of quarry men and women to start their careers in the quarry industry. In addition to local employment opportunities, Quarry Solutions will provide opportunities for educational site visits for local schools and other community groups to learn about the role that quarries play in the construction industry and how the materials which are essential for building roads and houses are produced.

Quarry Solutions anticipate the project will bring direct expenditure in the local economy of up to $1,900,000 per annum for the life of the project. Quarry Solutions anticipate this direct expenditure will incorporate between 8 to 10 jobs locally based job opportunities generating up to $800,000 per annum in wages. Indirect employment will be created in the local region to supply support services to the project, such as food, accommodation, repairs and maintenance, and transport. In addition to this the project will require support services and supplies such as food, cleaning, accommodation, equipment hire, fencing, general hardware supplies, plumbing, repairs and maintenance, fuel, stationery, and transport. The value associated with these supply and service supports will vary depending on the stage of the operation, but they will be up to $700,000 per annum.

Quarry Solutions also anticipate temporary hire of equipment may be required from time to time to meet production peaks if maintenance of plant and equipment reduces the capacity of the fleet on site. Crushing and screening equipment, dump trucks and front end loaders, water trucks , excavators, road haulage trucks and general hire equipment may be required and annual spend will be up to $400,000 subject to production demands and breakdowns requiring replacement equipment.

Richmond Valley Council also hold a Section 94 Heavy Haulage Contribution Plan under which a payment of $1.08 per tonne is required to compensate for pavement impacts likely to be generated on the local road network. Based on the maximum extraction rate of 1,000,000 tonnes per annum this would result in an annual contribution of $1,080,000.

Taking into consideration the anticipated direct expenditure in the local economy of $1,900,000 in addition to the annual Section 94 contribution of $1,080,000 the project will contribute up to $2,980,000 annually to the local area. This direct expenditure combined with the overall the socio-economic and road safety improvements of the Pacific Highway upgrade project to which the project will contribute are predicted to result in a net benefit over the life of the project to the community.

7.14 Hazards

SEPP 33 has been considered as the policy applies to developments that are considered potentially offensive which is considered to be any project which requires an EPL from the EPA. A review of the project has been undertaken to consider whether a Preliminary Hazard Analysis (PHA) is required. The review has considered the criteria for hazardous material storage quantities outlined in Table 3 of the SEPP 33 guideline (Department of Planning 2011a). Quarry Solutions have advised that the project will not store more than the threshold amounts and that diesel fuel will not be stored with Class 3 flammable liquids. It is also understood that the site will not have an explosives storage magazine or on-site storage of Class 5.1 ammonium nitrate suspension. Based on this information, the development is not considered potentially hazardous.

The review has also considered the criteria outlined in Table 2 of the SEPP 33 guideline in relation to transportation of dangerous goods. It is anticipated that the project will require Class 5.1 (III) ammonium nitrate suspension as an explosive pre-cursor. Deliveries of the product may occur in single bulk delivery above the 2 tonne threshold. However, it should be noted that the same product is currently relied upon for the Petersons Quarry. Nevertheless, the project would therefore be considered a potentially hazardous development with respect to the transport of dangerous goods. Therefore, the project should be assessed against the requirements of the Hazardous Industry Planning Advisory Paper No 11: Route Selection (HIPAP11) (Department of Planning 2011b). The advisory paper directs that a route assessment should consider the following:

- Examination of the road hierarchy and identification of routes for heavy vehicle transportation;
- Elimination of those routes where there are legal or physical constraints, special/sensitive land uses or where there is inadequate emergency access;
- Rating the potential routes on the basis of environment and land use risk factors, traffic factors and economic factors;
- A comparison of each of the route alternatives on the basis of their rating against each of the factors.

In relation to the above, all dangerous goods for the project and the existing Petersons Quarry rely on the proposed project haul route to and from the Pacific Highway at Woodburn. No other route is used and this will not differ as a result of the project. The traffic impact and pavement assessment for the project has confirmed that the proposed project haul route does not require any road or intersection upgrades. Therefore, a detailed transport safety study is not warranted for the continued transport of dangerous goods to the site.

In relation to bushfire hazard, the Richmond Valley Council Bushfire Prone Land Map 2015 identifies the existing patch of vegetation straddling Lot 402 and 403 DP802985 as Bushfire Vegetation Category 2 with a 30m buffer. That vegetation is to be retained and protected for the duration of the project and contained within a Non Disturbance Zone. The stockpile areas adjacent to the vegetation will provide effective fire breaks and act as Asset Protection Zones to project infrastructure. It is noted that buildings associated with the project will not be located in proximity to that vegetation. It is also noted that the project would not constitute a special fire protection purpose as defined by the *Rural*

Fires Act 1997, and therefore would not trigger the need to obtain a bush fire safety authority. Nevertheless, the management measures outlined in the EMP and availability of plant and equipment such as water trucks will assist in mitigating potential bush fire risk.

The principal wastes likely to be generated by the project may include but are not necessarily limited to:

- Classified liquid and non-liquid wastes (e.g. batteries, oil filters, waste oil, hydrocarbons and containers, oil/water emulsions and tyres)
- Metal and used or faulty parts and equipment
- Food scraps, packaging and consumables (e.g. paper, cardboard)
- Green waste.

These wastes are consistent with those already generated by the Petersons Quarry operations and the project will be serviced by a licensed waste contractor. Management measures in relation to wastes are included within the EMP (refer Attachment 2). Accordingly, it is considered that wastes generated by the project are unlikely to have a significant detrimental impact on the environment.

7.15 Cumulative Impacts

Cumulative impacts, relate to the potential interaction of the project and its potential impacts with other activities and land uses in the local area and those potential impacts.

The project is located adjacent to and including land associated with the existing Petersons Quarry which would continue operation for the life of the project and beyond. The project has been designed and assessed as a continuation of the existing Petersons Quarry such that both activities will occur in tandem but managed as a single project by Quarry Solutions.

The project is also located in proximity to an existing industrial facility (manufacture of precast concrete panels) located immediately south of the site but will have limited interaction with the facility.

The project would result in additional extraction of approximately 10.3ha of land above and beyond that anticipated to occur in association with the existing Petersons Quarry. The site is located on land partly zoned RU1 Primary Production, and partly zoned E2 Environmental Conservation. The proposed development is solely located on land zoned RU1. Within the RU1 land zone, an extractive industry is permissible with consent. Therefore, the project is consistent with the zone and intent of the LEP.

As the land associated with the project incorporates the existing and approved extent of the Petersons Quarry consideration must be given to the existing regulatory requirements of the Petersons Quarry. The Petersons Quarry is subject to a consent and EPL of significant age and limited conditions. Accordingly, it is known that the project will be subject to more stringent and comprehensive regulatory requirements and conditions. As a result, to the extent that the Petersons Quarry will continue operation during the life of the project, it will be operated to a standard consistent with the regulatory requirements imposed on the project. This approach will ensure that environmental management and monitoring of the operations of the project will be consistent. In essence, the Petersons Quarry will become part of the day to day operation of the project for the life of the project with the exception that the project will not rely upon the extractive resource within the Petersons Quarry which is to be retained for the future use of the local region and not for supply to the Pacific Highway upgrade project. Adopting this approach to the regulatory requirements of the project is consistent with the assessment of noise, dust, surface water and traffic impacts which have considered the cumulative impacts of the continuation of the Petersons Quarry for the life of the project.

As discussed in previous section cumulative impacts to biodiversity, cultural heritage and surface water have been considered as the project encompasses the existing and approved extent of the Petersons Quarry. By ensuring that the existing and approved extent of the Petersons Quarry is incorporated within the project area the cumulative impacts of vegetation clearing and land disturbance are known, measurable and manageable. Subsequently, the project has been designed to avoid impacts to those values.

As discussed in Section 7.12, cumulative impacts to the capacity of the surrounding land to be used for agriculture has been considered. Lot 401 is currently used for rural activities (cattle grazing) and the project will for the life of the project interrupt that use. However, the proposed rehabilitation objectives for the project will see Lot 401 returned to a post extraction land form suitable for recommencement of rural activities. It is also noted that Lot 401 is only a small land holding when considered in the context of the broader rural landscape. Accordingly, there is not a significant cumulative impact on the capacity of the nearby land to support viable rural activities.

As discussed in Section 7.10 cumulative impacts to visual amenity of the surrounding land are not significant as the Petersons Quarry is an existing feature of the landscape. Potential impacts have been addressed and minimised through design of the project including retention of native vegetation and establishment of noise attenuation bunds which assists in obscuring views of the existing Petersons Quarry and will also assist in obscuring the views of the project.

As discussed in Section 7.3 the assessment of potential traffic impact associated with the project have taken into consideration background traffic associated with the Petersons Quarry and determined that the proposed haul route is suitable in its current form and does not require any upgrades to cater to the project and continued operation of the Petersons Quarry.

In relation to potential noise, dust and vibration emissions which could occur concurrently, the potential impact for each has been considered and is not expected to have an adverse effect on nearby sensitive receptors compliance with the more stringent requirements of the project will be adopted for the Petersons Quarry. This will ensure that the Petersons Quarry and the project are operated in tandem pursuant to the same environmental controls for the life of the project.

7.16 Principles of Ecologically Sustainable Development

The *Protection of the Environment Administration Act 1991* outlines a number of principles of ecologically sustainable development (ESD). These are presented and discussed below in relation to the project.

7.16.1 The precautionary principle

According to the precautionary principle, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be seen as a reason not to protect the environment. The use of the precautionary principle implies that proposals should be carefully evaluated to identify possible impacts and assess the risk of potential consequences.

A sufficient level of scientific certainty in relation to potential project impacts has been achieved through detailed evaluation of all key issues including specialist assessments for biodiversity, traffic, noise, dust and blasting impacts. Conservative worst case analysis have been adopted where there is uncertainty in data used to inform assessments. The assessment process has been guided by a detailed study of the existing environment which has resulted in the project avoiding impacts to areas of environmental significance. The development of mitigation measures and safeguards to manage impacts aims to reduce the risk of serious and irreversible impacts on the environment. Generally, throughout this assessment, there has been found to be a low level of uncertainty in the data relied upon and the findings of the assessment.

7.16.2 Inter-generational equity

The principle of inter-generational equity requires the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. The project would involve the use of finite resources (for the upgrade of the Pacific Highway), and contribute minimally to climate change. The design of the project avoids areas of environmental significance on the site thereby ensuring they are maintained for the benefit of future generations.

7.16.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity are a fundamental consideration of ESD. The impacts of the proposal on local populations of threatened species, threatened communities and their habitats have been

assessed in detail in this EIS and Attachment 5. The project avoids impacts to areas of environmental significance on the site thereby conserving the biological diversity of species located on the site.

7.16.4 Appropriate valuation of environmental factors

This principle requires that "*costs to the environment should be factored into the economic costs of a project*". This EIS has examined the environmental consequences of the project and identified mitigation measures where there is potential for adverse impacts to occur. Requirements imposed in terms of implementation of these mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

8. Summary of Commitments

The SEARs for the project required a summary of all proposed environmental management and monitoring measures for the project. Accordingly, if development consent is granted, Quarry Solutions will commit to the following:

Project life

1. The project approval life will be for 7 (seven) years from the date of development consent, subject to the completion of the Pacific Highway upgrade project and noting that closure and rehabilitation activities may extend beyond the 7 (seven) year operational approval period.

Extraction rate

2. The project shall not extract more than 1,000,000 tonnes per annum from the Coraki Quarry, noting that the Coraki Quarry is separate from and in addition to the existing Petersons Quarry annual extraction volumes.

Hours of operation

3. Quarry operations will be undertaken between 6am and 7pm Monday to Saturday.
4. Blasting activities will be undertaken between 9am and 3pm Monday to Friday.
5. No operations will be undertaken on a Sunday or on public holidays.

Environmental management

6. The project will be undertaken in accordance with the EMP (refer Attachment 2). Prior to the commencement of the project the EMP will be updated to reflect relevant conditions of consent and other relevant authorities.

Aboriginal Heritage Management Plan

7. An Aboriginal Heritage Management Plan is to be prepared. Quarry Solutions will carry out the project in accordance with an Aboriginal Heritage Management Plan.
8. The identified Non Disturbance Zones will be protected in situ for the life of the project.

Traffic management

9. Sealing of Seelems Road and the first 200m of the internal access road within Lot 403 DP802985.
10. Implementing and enforcing compliance with a Driver's Code of Conduct.
11. Installation of forward and driver facing cameras on haulage trucks managed by Quarry Solutions.
12. Installation of GPS monitoring devices on haulage trucks managed by Quarry Solutions.
13. Paying for the installation of GPS monitoring devices on all local school buses where permission is provided.
14. Paying the relevant s94 contributions to the Richmond Valley Council.

Biodiversity

15. The measures outlined in the BAAM Biodiversity Assessment Report (refer Attachment 5) will be implemented including, but limited to the following:
    - Implement a 25m buffer to the *Macadamia tetraphylla* located on Lot 401 and the management and monitoring actions identified in Table 4.1 of the Biodiversity Assessment Report.
    - Engage a fauna spotter to inspect the Hoop Pine dry rainforest community for signs of nesting by the Black-necked Stork during May to January (inclusive). If any nesting activity is identified, a species management plan is to be developed and implemented.
    - Restrict disturbance and access to only those areas absolutely necessary for the construction and the operation of the project. Clearly cordon off all adjacent vegetation and buffer extents that are not to be disturbed by the project, creating 'no go zones' for vehicles, materials, machinery, workers, excavated soil or fallen timber.
    - Implement sediment and erosion control measures, including measures to avoid the spill of earth and rock downslope of the quarry footprint into areas of retained vegetation.
    - Ensure a fauna spotter/catcher is present during clearing and site preparation works.
    - Establish 'go slow zones' (40km/hr) for vehicles and machinery where non-gazetted roads or tracks are located adjacent to patches of native vegetation communities.

- Limit construction and operational work to 6am and 7pm Monday to Saturday, and any lighting within outdoor areas should comply with relevant Australian Standards and be of low spillage, with no or limited upward spillage.
- Minimise vehicle and machinery access and subsequent soil compaction and weed transfer risk within and adjacent to retained vegetation.
- Educate the workforce on the location of significant/sensitive communities and species and potential impacts from unauthorised activities.

Noise

16. The noise mitigation measures specified in Section 2.6.2 of the MWA Noise and Dust Assessment (refer Attachment 6) are to be implemented and maintained for the project, including the following:
    - Acoustic screening by way of cut, earth bunds and/or barriers to various locations;
    - Use of a proprietary quietened rock drill; and
    - Operation of the processing plant at the most shielded location and/or implementation of acoustic treatments as necessary to comply with the relevant noise limits.

Dust

17. The dust control measures specified in Section 4.3.3 of the MWA Noise and Dust Assessment (refer Attachment 6) are to be implemented and maintained for the project, including the following:
    - Watering of all haul roads and access roads at a rate of approximately 2 litres/m^2/hour at times when dust emissions are visible from vehicle movements;
    - Sealing (e.g. asphalt) part of the access road off Seelems Road for a minimum length of 200 metres west from the Seelems Road entry point;
    - Use of effective water sprays on the processing plant;
    - Effective water misting sprays to processing plant at transfer points including load-out points from elevated storage bins if utilised;
    - Rock drill to have an appropriate dust extraction system with collector fitted to rig and/or wet drilling via water sprays; and
    - Management of dust emissions from stockpiles during high wind speed conditions through appropriate use of sprinklers and/or chemical suppressant products as required.

Blasting

18. The following blast management measures will be implemented for the project:
    - Establish permanent blast monitoring locations at the two closest neighbouring properties, which are 140 Newmans Road (Lot 4 DP6339) and 200 Lagoon Road (Lot 12 DP6339), Coraki.
    - Start developing a blast vibration equation, specific to the Coraki Quarry. A suitably qualified person should be involved in this process, as using incorrect techniques can add additional cost to blast vibration control;
    - Commence blasting using a maximum of a 12 m bench height and 89 mm blast holes to ensure compliance with airblast overpressure and blast vibration. After 3 blasts, the results can be reviewed and evaluated as to whether 102 mm blast holes should be implemented. The airblast overpressure and blast vibration compliance must be maintained;
    - Establish the recommended Blast Exclusion Zones (BEZ). If required measure the flyrock projection distances from the first 10 blasts and recalibrate the flyrock equations. This will enable optimisation of the BEZ distance. Due to the use of a conservative value for the constant K in the prediction equations it would be expected that the exclusion distance could be reduced, however this must not be taken for granted;
    - All blasts must be face profiled, surveyed and bore tracked to ensure airblast overpressure compliance, combined with the ability to control face burst that can cause flyrock incidents;
    - Blast volumes should be maximised to reduce the frequency of disturbances to the neighbouring properties. A target blast volume of 18,750m^3 and 15 tonnes of bulk explosive load is recommended. Shot sizes should be limited to a maximum of 3 rows deep initially, to minimise vibration reinforcement if utilising a non-electric initiation system. Once actual blast vibration data has been collected and analysed shot sizes may be increased, if the data supports increasing the blast Maximum Instantaneous Charge (MIC) and remaining under 5mm/s;
    - Orientate blasts with free faces not directly facing the sensitive receivers, to assist with airblast overpressure control;

- Initiation sequencing for initial blasts, should target no more than a single blast hole MIC of 88kg until the vibration attenuation can be accurately assessed.
- All proposed parameters are for initial blasting at the site. Once actual blast data is available from blasting at the proposed site, then parameters may be optimised using the analysis techniques outlined in this document. Site specific constant (k value) will require calibration for flyrock, blast vibration and airblast overpressure.

Water

19. The surface water management system and water balance scenario prepared by Calibre Consulting (refer Attachment 8) will be implemented.
20. The project will be operated in accordance with the conditions of the EPL for the project once it is issued by the EPA.

Greenhouse gases and hazards

21. Quarry Solutions will continue to investigate financially practicable initiatives to reduce energy consumption and greenhouse gas emissions.
22. Dangerous goods will be stored in accordance with dangerous goods storage requirements and relevant Australian Standards.

Rehabilitation

23. Upon terminal benches being reached within Lot 401, the areas of disturbance within Lot 401 will be rehabilitated to a safe, stable and non-polluting state, suitable for the recommencement of the previous land use (cattle grazing).
24. Areas of the Petersons Quarry used by the project will be returned to the land owner in a safe and stable state suitable for the continued operation of the Petersons Quarry.

Community engagement

25. Quarry Solutions will operate a free call telephone number for the Coraki Quarry for the life of the project.
26. Quarry Solutions will engage with the community in relation to employment opportunities and traineeships.
27. Quarry Solutions will provide opportunities for educational site visits by local schools and other community groups to visit the quarry.

9. Conclusion and Justification

The proposal by Quarry Solutions Pty Ltd to establish the Coraki Quarry (the project), at Coraki, New South Wales is to be assessed as a State Significant Development pursuant to the *State Environmental Planning Policy (State and Regional Development) 2011* and therefore requires development consent under the *Environmental Planning and Assessment Act 1979*.

The project would extract a maximum of 1,000,000 tonnes per annum, primarily for the planned upgrade of the Woolgoolga to Ballina – Pacific Highway upgrade project (Pacific Highway upgrade) and thereby support and enhance the economic viability of the region. Consent is being sought for a period of 7 years subject to the progress of the Pacific Highway upgrade project and not including the necessary time for completion of any rehabilitation works.

The project has been designed to avoid impacts to the areas of environmental significance on the site where practicable and minimise any remaining potential impacts through appropriate design and management measures. A thorough and comprehensive assessment of existing environmental values and potential environmental impacts have been undertaken. Environmental aspects considered by this EIS include the following:

- Aboriginal and history heritage
- Traffic impacts
- Biodiversity impacts
- Noise, Dust and Blasting impacts
- Surface water management
- Resource characteristics

These matters were subject to detailed specialist assessments which identified project specific mitigation measures to avoid and minimise potential environmental impacts.

Extractive industries are a significant contributor to the material needs of local and regional communities and to economic activity and development. Extractive resources are site specific, limited in occurrence by geological conditions and are finite. Because they are high-volume, low-cost materials, they need to be located close to the communities that use them as the cost of transport to the end user contributes greatly to the overall cost of the delivered product. Extractive resources underpin all urban and infrastructure development and make a major contribution to the ongoing economic growth of the community through direct and indirect employment opportunities.

The NSW Roads and Maritime Services (RMS) identified the construction material requirements for the Pacific Highway upgrade project in the EIS prepared for that project (RMS 2012). Specifically, Section 6.4 of the EIS identified an estimated demand of 1,230,000 tonnes of road base and 1,400,000 tonnes of aggregate. The RMS rightly identified that '*Quarry outputs are restricted by the licence for the facility*' and commented that some materials may need to be sourced from further afield if not available in the required volume locally. As such, there is a known need for the construction materials that can be supplied by the project. Source material testing indicates that the resource is likely to be suitable for use in high quality road base, concrete aggregate, sealing aggregate and asphalt aggregate in accordance with the stringent specification requirements anticipated for the Pacific Highway upgrade project.

The potential environmental impacts of the project have been identified and measures proposed to manage and mitigate those impacts. Therefore, it is considered unlikely that the project would have a significant detrimental impact on the environmental values of the site. The project would provide economic benefits to the local community through additional employment whilst also providing improved material delivery efficiencies to the Pacific Highway upgrade project which will benefit the wider region. Accordingly, it is considered that the proposal is justified and its impacts acceptable subject to the implementation of the management and mitigation measures identified by this EIS and supporting specialist assessments.

10. Declaration

This Environmental Impact Statement provides a true and fair assessment of the proposed Coraki Quarry Project in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal. This statement has been prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Environmental Impact Statement prepared by
Name: James John Lawler
Qualifications: BBltENV (Urb&RegPlan), GradDip (UrbDes)
Address: 6 Mayneview Street, Milton, QLD 4064

In respect of the proposed Coraki Quarry Project

Proposal
Applicant name: Quarry Solutions Pty Ltd (Quarry Solutions) ABN 13 133 700 848
Applicant address: 24A Ozone Street, Chinderah, NSW, 2487
Land to be developed: As shown in the Environmental Impact Statement (Drawing 1837.027 Conceptual Site Layout Plan).

Environmental Impact Statement
An Environmental Impact Statement is attached.

Certificate
I certify that I have prepared the contents of this Environmental Impact Statement and to the best of my knowledge:

i. the statement has been prepared in accordance with Schedule 2 of the NSW Environmental Planning and Assessment Regulation 2000;
ii. the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates; and
iii. that the information contained in the statement is neither false nor misleading.

Name: James John Lawler
Date: 4 November, 2015

11. References

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drawings

attachments

Attachment 1

SEARs

Attachment 2

EMP

Attachment 3

Aboriginal Cultural Heritage Assessment Report

Attachment 4

Traffic Impact and Pavement Assessment Report

Attachment 5

Biodiversity Assessment Report

Attachment 6

Noise and Dust Assessment

Attachment 7

Coraki Quarry Proposed Blast Parameters Evaluation

Attachment 8

Surface Water Management Assessment

Attachment 9

Resource Assessment