



Dolwende Quarry Project

Environmental Impact Statement

Upper Hunter Holdings Pty Ltd

3 December 2015

**Project No.
2013.006**

Dolwendeer Quarry Project

Environmental Impact Statement

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Glossary and Abbreviations

AHIMS	Aboriginal Heritage Information Management System
AQIA	Air Quality Impact Assessment
APZ	Asset Protection Zone
ABS	Australian Bureau of Statistics
BH	Bore Hole
BOMP	Biodiversity Offset Management Plan
BOS	Biodiversity Offset Strategy
BSAL	Biophysical Strategic Agricultural Land
CEMP	Construction Environmental Management Plan
CH ₄	methane
CIC	Critical Industry Cluster land (in relation to the Upper Hunter Strategic Regional Land Use Plan)
CMA	Catchment Management Authority
CO ₂	carbon dioxide
dBA	A-weighted decibels
DECC	The NSW Department of Environment and Climate Change
Dolwende	The rural property where the Project occurs, known as “Dolwende” comprising Lots 1, 2, 3 and 4 in DP 1160936 and Lot 1 in DP 1178562.
DP&E	Department of Planning and Environment
DNG	derived native grassland
EIA	Environmental impact assessment
EIS	Environmental impact statement. Required by section 112 of the EP&A Act in certain circumstances.
EEC	Endangered Ecological Community
EP	Endangered Populations
EP&A Act	The NSW Environmental Planning and Assessment Act 1979. Provides the legislative framework for land use planning and development

	assessment in NSW.
EP&A Regulation	The NSW Environmental Planning and Assessment Regulation 2000
EPBC Act	The Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPA	Environment Protection Authority
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
FEL	Front End Loader
GHG	Greenhouse Gas (emissions)
GOE	Groundwater Dependent Ecosystem
HFCs	hydrofluorocarbons
HMP	Heritage Management Plan
INP	NSW Industrial Noise Policy
ILUA	Indigenous Land Use Agreement
LGA	Local Government Area
LEP	Local Environmental Plan
LALC	Local Aboriginal Land Council
MNES	Matters of “national environmental significance” (as defined in the EPBC Act)
N ₂ O	nitrous oxide
NEPM	National Environmental Protection Measures
NGER	National Greenhouse and Energy Reporting
NPW Act	National Parks and Wildlife Act 1974
NVIA	Noise and Vibration Impact Assessment

OEH	NSW Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
PAH	Polycyclic Aromatic Hydrocarbons
PESCP	Progressive Erosion and Sediment Control Plan
PFCs	perfluorocarbons
PM _{2.5}	Particulate matter less than 2.5 microns
PM ₁₀	Particulate matter less than 10 microns
PSNL	Project Specific Noise Level
RAMSAR	Wetlands of International Significance
RBL	Rating Background Level (noise)
REF	Review of Environmental Factors
REP	Regional Environmental Plan
Resurfacing	Removal and replacement of the existing pavement surface
RMS	Roads and Maritime Services
RNP	NSW EPA Road Noise Policy
RTA	The NSW Roads and Traffic Authority. Now known as RMS
SAL	Strategic Agricultural Land (in relation to the Upper Hunter Strategic Regional Land Use Plan)
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy.
SF ₆	sulphur hexafluoride
SRD SEPP	State and Regional Development SEPP
SSD	State Significant Development
SRLUP	Upper Hunter Strategic Regional Land Use Plan
SWMP	Soil and Water Management Plan
TCP	Traffic Control Plan
TEC	Threatened Ecological Communities

TMP	Traffic Management Plan
TPH	Total Petroleum Hydrocarbons
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UHH	Upper Hunter Holdings Pty Ltd
VPA	Voluntary Planning Agreement
WAD	Works Authorisation Deed (under RMS)

Statement of Authorship

Submission of Environmental Impact Statement (EIS)

EIS Prepared By:

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Qualifications: Bachelor of Environmental Science (BEnv Sc, Hons)
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Development Application:

Proponent Name: Upper Hunter Holdings Pty Ltd

Proponent Address: Level 5, 131 Clarence Street, Sydney NSW 2000

Land to be Developed: Lots 2, 3 and 4 in DP1160936 and Lot 1 in DP 1178562
770 Golden Highway, Hollydeen
Muswellbrook Local Government Area

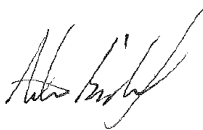
Development Description: Dolwende Quarry Project

Declaration:

I declare that:

- the statement has been prepared in accordance with *Schedule 2 of the Environmental Planning and Assessment Regulation 2000*;
- *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*
- *that the information contained in this statement is neither false or misleading.*

Name: KMH Environmental Pty Ltd
Adam Bishop



Signature:

Date: 3 December 2015

Executive Summary

This EIS

This Environmental Impact Statement (EIS) report has been prepared by KMH Environmental Pty Ltd (KMH) on behalf of UHH to accompany the SSD application for the proposed Project. This EIS has been prepared pursuant to the SEARs for the project originally issued on 24 June 2014 and later updated and re-issued on 22 April 2015. A copy of the SEARs is included in **Appendix A**. The SEARs were compiled in accordance with the requirements in Clause 6 and 7 of Schedule 2 of the EP&A Regulation.

The purpose of this EIS report is to:

- Provide a comprehensive description of the project and the lands affected;
- Assess the potential environmental impacts of the Project on the physical, social and economic environment (having regard to both current and future land use);
- Identify management and mitigation measures to be implemented to minimise potential impacts associated with the Project; and
- Justify the proposed Project, including suitability of the Project site and its alignment with whether the proposed Project is in keeping with public interest.

The key recommendations and management measures described in the report have been included in **Chapter 7**. They would form a key component of any conditions of approval issued for the Project.

The Project

Overview of Proposed Project

Upper Hunter Holdings Pty Ltd (UHH) is proposing to establish a sandstone and conglomerate quarry on the property “Dolwendee”, near Denman in the NSW Hunter Valley (the “Project”). The Project site is located within the Muswellbrook Local Government Area (LGA) approximately 20 km southwest from Muswellbrook and 7 km northwest from Denman.

The Project involves the proposed construction and operation of a conventional quarry operation with an active extraction area (limited to approximately 10.5 hectares), raw material and product stockpiles, crushing and screening plant, and a small office, amenities and car parking space. An internal haul road approximately 2.5km long would connect with the Golden Hwy near Dolwendee Homestead.

The Project targets the staged extraction and processing of conglomerate and pebbly sandstone to produce a range of crushed products including select fill, road and railway base and mine blast-hole stemming. The total resource targeted for extraction is approximately 5.3 million tonnes. The estimated extraction rate is up to 250,000 tonnes/year and provides for over a 21 year extraction period.

The proposed quarry is to be located on Lot 2 in DP 1160936 with proposed haul road access over Lots 3 and 4 in DP 1160936 and Lot 1 in DP1178562, which are all owned by UHH. The total resource proposed for extraction under this development application has been estimated as 5.3 million tonnes and at a planned extraction rate of up to 250,000 tonnes per year provides for over a 21 year extraction life.

The proposed quarry will result in generation of employment and demand for products and services, and would contribute to economic activity in the local area. It would provide a source of aggregates not currently available in the local area, reducing the need to transport materials long distances by road into the subject area.

Need for the Project

The proposed Dolwende Quarry seeks to maximise the economic and productive use of the land which contains a viable geological resource with limited alternative uses. The agricultural capability of the land is low and historical use of the land has been limited to low intensity sheep and cattle grazing.

The number of construction and mining projects currently under way or in planning has led to demand outstripping supply for the type of extractive products to be produced at the quarry. Such projects include the proposed Golden Highway Upgrade and upgrade to local roads, various coal mine expansions, agribusiness proposals and local residential subdivisions, all of which are close to the proposed quarry.

The proposed quarry will result in generation of employment and demand for products and services, and would contribute to economic activity in the local area. It would provide a source of aggregates not currently available in the local area, reducing the need to transport materials long distances by road into the subject area.

There are few alternate uses for the land where the proposed Project is to be established. The grazing qualities of this area are limited at best and the rugged nature of the terrain allows for limited alternate uses. The soils of the proposed gravel extraction area are relatively infertile solodic soils. An agronomist's assessment (**Appendix D**) confirms that no prime agricultural land would be affected. The Project is sufficiently distant from important equine and viticultural lands so as to pose no appreciable risk to these important local agricultural industries. Furthermore, the appreciable buffer distances (exceeding 1.5 km) that exist between the proposed quarry and offsite residential receivers, plus the screening effects of topography and vegetation, support an overall assessment that the proposed quarry would not pose unacceptable impacts to the neighbouring community.

Site Description

The Project occurs on rural lands that have been largely cleared, and have historically been used for cattle and sheep grazing. The property contains some patches of remnant and regrowth native vegetation. The largest intact area of native vegetation is associated with a prominent rocky ridge, to the south of the proposed quarry disturbance footprint.

The local topography is characterised by gentle rises and slopes, though is dominated by a prominent horseshoe-shaped hill and sandstone ridgeline would not be impacted by the project. The proposed quarry footprint is located on the northwest facing slopes to the north of this ridgeline. The landscape is relatively stable with only minor localised areas of sheet erosion evident.

The property drains to Wybong Creek (a tributary of Goulburn River) which is located approximately 1km west of the Project. The property drains to Wybong Creek (a tributary of Goulburn River) which is located approximately 1km west of the Project. The nearest watercourse downstream of the proposed quarry is further than 400 m away.

The Project is surrounded by cleared rural properties to the south and west, and is adjacent to the Glencore-operated Mangoola Coal Mine site to the north and east. The proposed quarry is relatively distant from neighbouring rural residences. The proposed quarry observed good buffer distances to offsite residential receivers. There are a number of residences to the south and west of the proposed quarry, the closest being approximately 1.5km away.

Resource Description

Extensive geological testing has been undertaken by RCA Australia to assess the extent and nature of gravel resource and its suitability for production of a range of construction materials. The investigations conducted by RCA confirm the site is underlain by a sequence of conglomerate and pebbly sandstone with occasional lithic sandstone layers which extends to at least the indicated depth

of proposed 30m deep quarry. This conglomerate and pebbly sandstone is the resource targeted for extraction.

Materials were tested to a broad range of material specifications in use in the local area. It was found that the quarried materials may be processed by crushing, screening and blending, as required, to provide materials meeting a range of different specifications. The initial operations are expected to focus on production of a small range of crushed products that require minimal processing or blending. These include a 7-14mm material suitable as road sub-base, and a 14-20mm material suitable for mine blast hole “stemming”.

Resource Estimate

VGT Environmental has prepared a detailed quarry plan that provides an optimised quarry footprint and geometry based on the site’s environmental constraints and geotechnical conditions. The quarry plan examines three conceptual stages of development including the proposed final landform.

Based on the VGT quarry plan the total volume of the deposit target for extraction is 2,295,000 cubic metres or 5,319,800 tonnes. This estimate is based on the results of density testing by RCA indicating the average core density is 2.318 Tonnes/m³. The target resource is considered to be part of a much larger sandstone and gravel resource expected to extend laterally well beyond the currently proposed extraction area. The assessment confirms an indicated resource exceeding 5 million tonnes within Lot 2, which would be targeted for extraction under the Project.

Extraction Rate and Quarry Life

UHH seeks approval to extract and transport to market an average of 250,000 tonnes of extractive material per year. The extraction rate is expected to fluctuate according to demand for product.

Based on the current indicated resource size of approximately 5.3 million tonnes, the proposed quarry provides for a greater than 21 year extraction period. The quarry life may exceed 21 years if the achieved extraction rates are less than predicted.

Should further exploration identify additional resource, the quarry life could extend well beyond this subject to obtaining any necessary additional approvals.

Quarry Description

The proposed quarry is to be a conventional open cut operation with an active extraction area (approximately 10.5 hectares), raw material and product stockpiles, crushing and screening plant, and ancillary facilities including a small office, workshop, amenities and car parking space. An internal haul road approximately 2.5 km long would connect the quarry to the Golden Highway.

The quarry activities (excluding product haulage) would be confined to Lot 2. A conceptual layout of the quarry is provided in **Figure 7**. It is anticipated that the processing area may relocate throughout the Project Area several times throughout the quarry life to meet operational requirements and efficiencies.

The quarry staging would be planned to minimise environmental impacts during all stages of its operations; for example, by limiting quarry-related disturbance to only approved areas, minimising forward stripping of topsoil and overburden, locating noisy and dust-generating plant so as to minimise noise and dust impacts, and implementing necessary stormwater controls prior to major disturbance.

A crushing and screening plant would be provided to produce the desired aggregates. The use of mobile diesel powered crushing/screening plant is being investigated to enable the plant to be located close to the extraction face, and so provide maximum machine productivity and output. In this case the excavator would load the crushing plant directly.

An extraction operations plan prepared by VGT Pty Ltd describes a conceptual staging plan for quarry development. It is expected there will be changes to these conceptual plans as the quarry develops, and the timeframe would be dependent upon weather and sales demand. This evolution would come

as a better understanding of the geology and geotechnical nature of the deposit reveals itself to the operators. The safety of all those working on the site is paramount to the design and operation of the quarry and it is expected that quarry plans will be modified and improved in conjunction with the Mine Safety Inspectorate.

Haul Road and Transport

The Project includes construction of an internal two lane haul road approximately 2.5 km long that would connect the quarry to the Golden Highway. The proposed haul road would be located over Lots 2, 3 and 4 in DP 1160936 and Lot 1 in DP1178562. The haul road would be unsealed except for approximately 50m nearest the Golden Highway that would be sealed to reduce noise, dust and sediment tracking issues.

Product would be transported to market via the internal haul road, thence to the west or east via the Golden Highway. Haul trucks are expected to include truck/trailer combinations and b-doubles, which carry some 33 and 39 tonnes each respectively. Based on an extraction rate of up to 250,000 tonnes per annum, and some 270 days operation per year, the proposed quarry would generate up to some 25 to 30 laden vehicles per day. It is likely that approximately 90% of movements would be eastbound along the Golden Highway. Over a 10 hour working day, this is equivalent to some two to three trucks per hour (four to six movements two-way).

Hours of Operation

The proposed hours of operation are:

- 7am to 6pm Monday to Friday;
- 8am to 1pm Saturday; and
- No work on Sundays or public holidays.

Work on Saturdays is optional and would occur subject to demand. The Project is expected to operate approximately 270 days per year.

Statutory and Planning Framework

Planning Pathway and Environmental Impact Assessment Process

Although relatively small in scale the Project nonetheless meets the definition of State Significant Development (SSD) as it is an extractive industry that proposes extraction from a total resource exceeding 5 million tonnes. The Project is identified as SSD_6519 and is to be assessed by the NSW Department of Planning and Environment (DP&E).

Approval is sought for this State Significant Development (SSD) under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Division 4.1 provides for development to be declared SSD either by a State Environmental Planning Policy (SEPP) or by order of the Minister. The Minister is generally the consent authority for SSD. In this case, the

Under clause 8 of the *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP), development is declared to be SSD for the purposes of the EP&A Act if, among other provisions, the development is specified in Schedule 1 or 2 of the State and Regional Development SEPP. The proposed development meets the definition and scale of Extractive Industry listed in Clause 7 of Schedule 1 of the State and Regional Development SEPP.

Under Section 78A of the EP&A Act an application for SSD must be accompanied by an Environmental Impact Statement (EIS). In accordance with *the Environmental Planning and Assessment Regulation 2000*, the Secretary is to issue environmental assessment requirements (SEARs) in relation to the proposed statement and the EIS must be prepared in accordance with these requirements.

Key Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of the Environment (DoE) and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as matters of 'national environmental significance' (MNES).

The Project was referred to the Commonwealth Minister for the Environment in March 2015. It was considered that the Project was unlikely to significantly impact any MNES. Based on the assessment submitted and the supporting documentation, the Minister for the Environment concluded that the Project is "not a controlled action".

Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derives from their traditional laws and customs. The Project occurs on a rural property known as "Dolwendee" comprising Lots 1, 2, 3 and 4 in DP 1160936. As these lots are under a freehold title, Native Title does not apply under the Native Title Act 1993.

National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) provides a single national framework for the reporting and dissemination of information about the greenhouse gas (GHG) emissions, greenhouse gas projects, and energy use and production of corporations. A preliminary GHG emissions and energy assessment has been presented in the EIS.

Key NSW Legislation,

Environmental Planning and Assessment Act 1979

The EP&A Act is the principal piece of legislation covering assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. The Project is classified as State Significant Development and development consent is being sought under Part 4 of the EP&A Act.

The objectives of the EP&A Act have been considered and the Project is found to be consistent with these objectives.

Threatened Species Conservation Act 1995

The TSC Act provides for the protection for threatened plants and animals native to NSW and integrates the conservation of threatened species into development control processes under the EP&A Act.

Umwelt (2015) conducted seven-part tests under the TSC Act for the two threatened flora species and six threatened fauna species recorded or suspected to occur within the Project Area and concluded that significant impacts are unlikely to occur on nationally threatened species.

Roads Act 1993

Section 138 of the Roads Act 1993 requires that consent be obtained prior to disturbing or undertaking work in, on or over a public road. The Project proposes the construction of a haul road and a new standard rural intersection off the Golden Highway to access the Project Area. Pursuant to Clause 89K of the EP&A Act, consent under Section 138 of the Roads Act 1993 cannot be refused if it is necessary for carrying out an approved SSD proposal.

Consultation with RMS would also occur over the intersection design and any additional approvals required from RMS such as a Works Authorisation Deed (WAD).

Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) is administered by the Environmental Protection Authority and provides for a system of environmental protection licences for scheduled development work and activities, as well as the ability to issue environmental protection notices for pollution and waste management. Environmental offences are also described under the POEO Act.

Schedule 1 of the POEO Act identifies types of development known as scheduled activities that require an environment protection licence. The Project meets the definition of a scheduled activity under Clause 19 and will require an Environmental Protection Licence (EPL).

Muswellbrook Local Environmental Plan 2009

The local environmental planning instrument that is relevant to the project is the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP 2009). As previously detailed, the Project Area is zoned RU1 Primary Production (RU1 zone) under the Muswellbrook LEP 2009. Extractive industry is permitted with consent within the RU1 zone.

Community and Stakeholder Consultation

A number of stakeholders were contacted during the development of the Proposal including the Aboriginal community, surrounding landowners and relevant government agencies. Their comments have been considered and documented in Section 5.

Community Consultation

The focus of community consultation has been to identify the key community stakeholders, consult with these identified stakeholders to provide them with details of the proposed Project, and give stakeholders an opportunity to provide feedback and identify any issues of concern so that these may be considered in the EIS.

The key community stakeholders were selected by investigation of the community within the immediate area of the Project. Although the Project is in a relatively isolated rural location surrounded by large landholdings, a small number of residential receivers and businesses are expected to have an interest in the Project. This process identified 22 key residential receivers which were selected for consultation. It is noted that of the 22 receivers, Receivers R1 to R8 inclusive and R10 have been acquired by Glencore Mangoola Coal. Receivers 15 and 16 are owned by the Proponent and a related party and are supportive of the Project.

Consultation with the key residential receivers was undertaken in October 2015. An Information Flyer with accompanying letter was prepared and distributed in person (preferably), or by mail if the land owner/occupier could not be contacted.

The Proponents undertook to meet with all the surrounding neighbours over two days between 7th and 8th October 2015. In some cases where contact details could be found the neighbours had been contacted in advance to arrange a meeting time.

A summary of the consultation activities undertaken and feedback obtained is provided in the EIS. A number of neighbours indicated they were supportive of the Project or had no particular interest in the Project. Several residents expressed concerns about the potential environmental and safety impacts of the Project. Key concerns identified by the community were potential for impacts from noise, dust and blasting, and concerns over the safety at the proposed haul road intersection with the Golden Highway.

Aboriginal Community Consultation

McCardle Cultural Heritage (MCH) undertook consultation with the local Aboriginal community in relation to the proposed Project. The consultation was undertaken in compliance with the four stage process required under the former Department of Environment, Climate Change and Water's (DECCW, now part of OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) (ACHCR).

Having sought expressions for members of the Aboriginal community to be involved in the Project, 11 Aboriginal stakeholders registered their interest. The registered Aboriginal parties were provided with information regarding the scope of the proposed project and the cultural heritage assessment process and requested to provide any cultural knowledge relevant to the assessment of Aboriginal cultural heritage. The registered Aboriginal stakeholders did not disclose any specific traditional/cultural knowledge or information of sites or places relevant to the Project. A survey of the Project area was undertaken on 17 February 2015 with representatives from the registered Aboriginal stakeholders. The draft *Aboriginal Heritage Impact Assessment* prepared for the project was forwarded to the registered Aboriginal parties in March 2015 for review and comment. A detailed outline of the Aboriginal cultural heritage assessment and consultation is provided in the EIS.

Agency Consultation

Consultation was undertaken with a number of Agencies during EIS development where necessary to seek support for proposed investigation methodologies, clarify the Agencies' requirements for the EIS or discuss external approval requirements. No additional or new matters were raised for assessment in the EIS.

Environmental Impact Assessment

The key potential environmental impacts have been identified through assessment of the Project scope, review of the SEARs issued by DP&E, and consultation with relevant government agencies and neighbouring landowners. All key potential environmental impacts have been assessed in detail in the EIS.

Overall, the environmental risks presented by the Project are not significant. A number of features of the Project contribute to this assessment, including:

- The relative isolation of the proposed quarry and the significant separation distances to the nearest residential and other sensitive receptors;
- Its location on low quality agricultural land that has limited alternative uses;
- The existing physical/topographical barrier to the south of the proposed quarry pit location and other topographic features which substantially limit visibility of the development from offsite lands;
- The immediate proximity of an appropriate biodiversity offset area;
- The Project's proximity to an established road network (Golden Highway); and
- The relatively small production rate and transport volumes on a daily/annual basis, resulting in low impacts to the local road network.

Where the analysis identifies potential environmental impacts, it concludes that these can be adequately managed through the incorporation of mitigation and management measures into the design or implementation of the Project during its construction, operation and closure.

A summary of the key environmental aspects assessed and the findings of the environmental impact assessment are provided below.

Biodiversity

A detailed ecological assessment of the Project was undertaken by Umwelt (2015) to describe the flora and fauna features present within UHH lands (hereafter referred to as the wider study area) and the potential ecological impacts due to the Project. Flora and fauna surveys were undertaken in spring 2014.

The Ecological Assessment report (Umwelt, 2015) is included in **Appendix K** and provides details regarding the ecology assessment including:

- Regional context and habitat connectivity;
- Surveys methodology;
- Threatened species, threatened ecological communities (TECs), endangered populations (EPs) and migratory species identified during surveys or during the literature review;
- Assessment of the level of flora and fauna impact due to the Project;
- Proposed mitigation and monitoring measures; and
- The proposed biodiversity offset strategy.

After refining the Project to reduce ecological impacts there remain a number of potential residual ecological impacts which include:

- Loss of approximately 22.2 hectares of native vegetation comprising:
 - 7.4 hectares of Central Hunter Grey Box– Ironbark Woodland EEC, which is also woodland habitat for threatened woodland birds and micro-bats including known habitat for grey-crowned babbler (*Pomatostomus temporalis temporalis*) and speckled warbler (*Chthonicola sagittata*); and
 - 14.8 hectares of non-threatened derived native grassland community;
- Removal of seven (7) pine donkey orchids (*Diuris tricolor*) identified within the Project area;
- Disturbance of 22.2 hectares of known and potential habitat for the pine donkey orchid (*Diuris tricolor*);
- Weed species could be inadvertently brought into the Project area with imported materials, or could invade naturally through removal of native vegetation;
- Introduced fauna species such as foxes, rabbits, pigs, dogs and feral cats could increase within the Project Area due to increased disturbance;

Based on the ecological values of the Project Area, the Project is unlikely to result in a substantial impact on ecological values. Despite this, a Biodiversity Offset Strategy has been prepared to address the residual impacts of the Project. A proposed Biodiversity Offset Area has been identified totalling 16 hectares in area. It is located to the north of the Project Area on Lot 1 DP1160936 which is currently owned and managed by UHH.

Air Quality

An Air Quality Impact Assessment (AQIA) was prepared by Todoroski Air Sciences (2015) and is provided in **Appendix L**. The AQIA was undertaken to assess the potential air quality impacts associated with the construction and operation of the Project. The AQIA was undertaken with consideration to the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005). A brief summary of the AQIA is provided in the following sections.

The assessment found that all sensitive receivers identified for the Project are likely to experience some level of existing dust impact due to the surrounding rural activities and operation of nearby coal mines including the Mt Arthur, Bengalla and Mangoola Coal mines. When considering the existing background dust levels along with the summary of predicted dispersion modeling for the Project, the cumulative results for average annual PM_{2.5} and PM₁₀ would remain below the relevant criteria.

Assessment of cumulative 24-hour average PM₁₀ was conducted to examine the potential maximum total (cumulative) 24-hour average PM₁₀ impacts for the Project. The NSW EPA approach was applied at the most impacted sensitive receiver locations. The assessment indicates low potential for cumulative 24-hour average PM₁₀ impacts at the nearest and potentially most impacted sensitive receptor locations. Given these locations show little potential for any significant impacts to occur, there would also be little prospect of any significant impact to occur due to the Project at all other sensitive receptor locations.

The emissions of pollutants generated from diesel powered equipment at a quarry are considered to be too low to generate any significant off-site pollutant concentrations, especially in this case where the nearest receptors are located at least 1km away.

It is predicted that all the assessed air pollutants generated by the Project would comply with the applicable assessment criteria at all sensitive receptors and therefore would not lead to any unacceptable level of environmental harm or impact in the surrounding area. Nevertheless, the site would apply appropriate dust and air emission management measures to ensure it minimises the potential occurrence of excessive dust emissions from the site.

Noise and Vibration

A Noise and Vibration Impact Assessment (NVIA) was completed by Muller Acoustic Consultants (2015) to quantify potential acoustic impacts associated with operation of the quarry on the surrounding Hollydeen community. The NVIA was undertaken in accordance with relevant guidelines and can be found in **Appendix M**. The assessment included:

- Measurement of the background noise environment using unattended and attended noise logging at two locations adjacent to The Golden Highway and Reedy Creek Road within the site property boundary. Background LA₉₀ levels were typical of a rural environment ranging from 29 to 42 dBA for daytime, 25 to 26 dBA for evening and 21 to 22 dBA for night time hours;
- Development of Project Specific Noise Levels (PSNLs) based on the intrusiveness and amenity criteria described in NSW Industrial Noise Policy (INP). PSNLs for the 22 modelled receivers range from 47 to 35 dBA;
- Establishment of road traffic noise criteria for the assessment;
- Use of a computer model to assess potential noise impacts associated with the construction and operation of the quarry. Four modelling scenarios were adopted in this assessment to represent noise emissions at various stages of the quarry life as the quarry progresses from east to west;
- Cumulative noise impact assessment;
- Quantification of blasting airblast overpressure and vibration and assessment against relevant guidelines.

The assessment found that the daytime predicted operational noise levels are below 35 dBA and below the recommended PSNLs for the Project. The predicted construction noise was also modelled and found to be below the relevant criteria from the Interim Construction Noise Guideline.

The traffic noise contribution from the quarry is predicted to be negligible compared to existing Golden Highway traffic. At the nearest privately owned residences the RNP criterion is predicted to be satisfied. Additionally, existing road traffic noise levels are not increasing by more than 2 dB and satisfy the relative increase noise criterion.

Results of the blast calculations identify that adopting an MIC of up to 100kg will satisfy the relevant ANZECC criteria at the nearest residential receivers for both overpressure and vibration. Blasting is not predicted to cause unacceptable impacts to surrounding receivers.

The predicted contribution of quarry noise to the surrounding catchment is generally <35 dBA. Therefore, the overall change to existing industrial noise levels is expected to remain below 35dBA and satisfy the INPs daytime amenity criteria of 50dBA, LAeq(period) for rural receivers.

Overall the Project is not predicted to cause unacceptable noise or vibration impacts though would adopt a range of appropriate noise mitigation measures to help limit the noise impacts of the Project.

Blasting

A blasting assessment was undertaken by Peter Bellairs Consulting Pty Ltd (2015) to provide information about indicative blasting design, assessment of blasting impacts and impact mitigation strategies. The assessment was undertaken in accordance with the *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC 1990). The Blasting Assessment report is included in **Appendix G**.

It has been identified that a significant proportion of the resource is too hard for conventional dozer ripping and that blasting will be required to extract the resource. An initial blasting design has been prepared that includes two initial drill and blasts on a 10m or 15m bench height. Based on the planned extraction rate a maximum of twelve but typically 8 blast events per year only would be required. Blasting would be very small in scale and infrequent, and insignificant compared with the blasting by major coal mines in the area. Blasting would be avoided during adverse meteorological conditions and blast monitoring would be undertaken in accordance with approval conditions.

The blasting assessment includes estimate of ground vibration and airblast overpressure based on the proposed blasting design, and presents a range of operational controls to minimise adverse impacts related to blasting. The assessment considered potential impacts to people, buildings, animals, infrastructure and significant natural features. It found that the proposed blasting is very small scale relative to the blasting activities of the major coal mines in the area. Relevant assessment criteria for blast induced ground vibration and air overpressure are readily achievable and impacts due to blasting should be negligible.

Surface Water

The EIS includes information on the surface water resources of the area and assesses potential impacts to surface waters. The dominant surface water drainage feature of the area is Wybong Creek, a tributary of Goulburn River, which occurs approximately 1 km west of the proposed quarry. The property drains to Wybong Creek mainly via sheet flow over gently sloping north, north-west and south-facing slopes. The proposed extraction area is not located near any existing drainage lines. The nearest watercourse to the proposed quarry is more than 400 m to the north, an intermittent first order watercourse that is highly disturbed with no appreciable riparian vegetation and located within cleared grazing land. Any stormwater discharge from site would need to travel overland more than 400 m before reaching the nearest watercourse and would then drain to a large licensed dam on the Hollydene property owned by the Proponent. The nearest waterway with any intact riparian habitat is Wybong Creek.

A range of potential surface water impacts were considered in relation to the Project including pollution of receiving waters due to runoff of sediment and other pollutants; and reduction in flows due to stormwater capture and use within the proposed quarry. The assessment found that due to the relatively small scale of the Project, and with implementation of an effective soil and water management plan, there is a very low risk of offsite impacts to water resources including to surface water flows, water quality, channel stability or the hydraulic regime of the Project Area or downstream. The nearest watercourse downstream of the proposed quarry is further than 400 m away and there is a very low risk of the quarry causing adverse impacts on the receiving waters due to its design (being internally draining), the large buffer distance to waterways and the expected high level of efficacy of the proposed soil and water controls.

A Soil and Water Management Plan would be prepared for the Project prior to construction commencing. This would outline the required erosion and sediment controls which would include a focus on:

- erosion control, as a pollution prevention strategy;
- runoff separation by diverting 'clean' stormwater runoff around the site or away from operational areas;
- capturing of dirty water for treatment and reuse; and
- management and maintenance of long-term controls.

Water Supply and Water Balance

The proposed quarry would require water for a range of uses:

- dust suppression;
- site revegetation; and
- material processing;

A water balance was prepared to estimate the water demand and assess the water supply options available to meet this demand. This estimate determined the annual non-potable water demand is approximately 23.5 ML/year. This is expected to be an upper limit once the quarry is in full production.

The primary means of water supply is expected to be reuse of dirty water runoff captured within sediment basins in the quarry and processing area. The predicted annual water yields from the disturbed catchment were estimated for a total area of 14.5 ha.

Based on the simplistic water balance it is predicted that the total annual water demand for processing and site management could be met by onsite water capture in a wet (90%ile) rain year providing the collection system is efficient and the dams are sufficiently large to minimise overflow losses. During normal and dry years there will be a water deficit. Additional water may need to be supplied from alternate sources.

Upper Hunter Holdings (UHH) holds water license 20CA212769 for water supply works comprising a 80mm centrifugal pump on Lot 6 DP 1160936 and authorising the abstraction of up to 142 ML per year from the Wybong Creek water source. The permitted use is Industrial and covers Lots 3 and 4 in DP 1160936. It is planned to amend the existing water license 20CA212769 so that water can be used on Lot 2 and to install a suitable pipeline within existing easement to deliver water to the quarry. This will provide a secure backup water supply that would be more than adequate to meet the needs of the Project.

Groundwater

RCA Australia (RCA) undertook geotechnical investigations at the site in April 2012 and September 2014. The investigations included the rock coring drilling of eight bore holes and the installation and measuring of groundwater depths in four (4) piezometers established in BH5, BH6, BH7 and BH8.

Monitoring was carried out by manually dipping the water level and sampling in 4 boreholes (BH5, BH6, BH7 and BH8 fitted with stand pipe piezometers), during 3 site visits and by automatic water level monitoring in the period between the site visits. Site visits were undertaken during the months of January, May and July of 2015.

Baseline groundwater monitoring was undertaken to ascertain and detail the following:

- Groundwater levels and response to climatic conditions;
- Groundwater gradient, velocity and flow direction;
- Groundwater quality and response to climatic conditions;
- Potential for groundwater interception by the proposed quarry; and

- Potential for impacts on groundwater quality and quantity.

The baseline groundwater monitoring found only minor changes in groundwater surface levels over the course of monitoring, with groundwater levels remaining at least 5 m below the planned depth of extraction and within the underlying coal seam. On this basis the proposed quarry is not predicted to intercept or impact on groundwater and would not require licensing in relation to groundwater.

Baseline water quality monitoring was undertaken and will form a benchmark against which any future changes in groundwater quality may be compared. It is proposed to undertake groundwater monitoring on an initial biennial basis.

In regard to the potential impacts to groundwater quality during quarrying operations this would be guarded against by conducting the operations in accordance with a suitably drafted Operational Environmental Management Plan which would include the following requirements to protect groundwater:

- Containment of any chemicals and fuels in lined bunded areas that are designed to safely accommodate the volume of the stored material;
- Containment of sewerage water and treatment out of the quarry in an approved manner; and
- Containment of truck wash water and processing water such that they can be processed and re-used.

Soils and Geology

Reference to NSW Geological Survey (NSW GS) geo-referenced 1:100,000 Hunter Coalfield Geology Google overlay indicates that the Project traverses the geological boundary between the Wollombi Coal Measures Glen Gallic Sub-group and the overlying Narrabeen Group Widden Brook Conglomerate. It is the sandstone and conglomerate material of the Narrabeen group that are targeted for extraction.

Soil Landscapes of the Singleton 1:250,000 Sheet (Kovac & Laurie, 1991) indicates that the Project Area and much of the Dolwende property contains the Sandy Hollow Soil Landscape. The rocky escarpment south of the proposed quarry is described as Lees Pinch Soil Landscape. The alluvial flats adjacent to Wybong Creek are described as Wollombi Soil Landscape.

The soils of the proposed gravel extraction area are gravelly solodic soils. Top soils are moderately to strongly acidic with the sub soil being slightly acidic to neutral in pH. The soils are very deficient in major and minor plant nutrients, have low water holding capacity, are imperfectly drained, are loose to hard setting and moderately permeable. The topsoil is weakly structured gravelly loam textured overlaying a reddish, yellow or brown medium clay subsoil.

Agricultural Assessment

Ross Watson Agriculture P/L was engaged to provide an initial agricultural appraisal of the site and assess the potential impacts of the proposed quarry on agricultural land and the environment. The agricultural assessment report (Ross Watson, 2015) is provided in **Appendix D**.

The lands within the approximately 160 ha Dolwende property were appraised and classified according to the Agricultural Land capability class system developed by NSW Agriculture. The major agricultural land classes on the site of the proposed gravel quarry are considered to meet the guidelines of Class 4 and 5 agricultural land, which have a low overall agricultural production potential.

The proposed gravel extraction activity will not directly involve or impact on any prime or good agricultural land (i.e. Class 1, 2 or 3 Agricultural Land), which may be considered for equine or viticultural usage.

This area of the proposed gravel quarry has a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district.

An equine establishment is located approximately 1.0 km in a south westerly direction from the proposed gravel quarry. There are no perceived direct impacts on this equine operation. Further consultation with these nearby landholders would be undertaken to gain an appreciation of their level of concerns, if any are raised.

It is expected that any impacts could be minimised and managed to prevent adverse impacts on surrounding activities or land holders.

Aboriginal Cultural Heritage

An Aboriginal Heritage Impact Assessment was prepared by McCardle Cultural Heritage Pty Ltd (MCH) for the proposed Dolwendee Quarry and is included as **Appendix O**. The report was prepared in accordance with the NSW Office of Environment and Heritage (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010), the OEH Guide to Investigation, Assessing, and reporting on Aboriginal Cultural heritage in NSW and the SEARs for the project which included specific requirements from the OEH.

The purpose of the assessment was to identify areas of indigenous cultural heritage value, to determine possible impacts on any indigenous cultural heritage identified (including potential subsurface evidence) and to develop management recommendations where appropriate. The assessment employed a regional approach, taking into consideration both the landscape of the study area (landforms, water resources, soils, geology etc.) and the regional archaeological patterning identified by past studies.

The following tasks were undertaken as part of the assessment:

- A review of relevant statutory registers and inventories for indigenous cultural heritage including the OEH;
- Aboriginal Heritage Information Management System (AHIMS) for known archaeological sites, the State Heritage Register, the Australian Heritage Database (includes data from the World Heritage List UNESCO, National Heritage List, Commonwealth Heritage List, Register of the National Estate) and the Muswellbrook Local Environmental Plan;
- A review of local environmental information (topographic, geological, soil, geomorphological and vegetation descriptions) to determine the likelihood of archaeological sites and specific site types, prior and existing land uses and site disturbance that may affect site integrity;
- A review of previous cultural heritage investigations to determine the extent of archaeological investigations in the area and any archaeological patterns;
- The development of a predictive archaeological statement based on the data searches and literature review;
- Identification of human and natural impacts in relation to the known and any new archaeological sites and/or archaeological potential of the study area;
- Consultation with the Aboriginal stakeholders as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010);
- A site inspection with the participation of the registered Aboriginal stakeholders; and
- The development of mitigation and conservation measures in consultation with the registered Aboriginal stakeholders.

The assessment found that whilst the regional environment provided resources, including raw materials, fauna, flora and water, that would have allowed for sustainable occupation of the area, this was not the case in the investigation area and immediate surrounds. Within the project area, the landforms and distance from reliable water sources and the associated resources indicate that the project area would not have been suitable for camping. Rather, areas along Wybong Creek and more so along the Goulburn River (over 1km away) would have been favoured for occupation.

The predictive model suggested that within the investigation area, it was possible that isolated finds and/or very small density artefacts scatters may be located and associated with hunting and/or

gathering and/or travel. The environmental context considered suitable for occupation, including close proximity to reliable water and associated resources and elevated landforms overlooking such water sources were absent from the study area.

A search of OEH's Aboriginal Heritage Information Management System (AHIMS) was undertaken by MCH on the 14 December 2014. The search identified 101 previously recorded Aboriginal sites within five kilometres of the study area. These include 96 artefacts (AFT), 2 shell (SHL), 1 scarred/carved tree (TRE), 1 artefact/Potential Archaeological Deposit (AFT/PAD) and 1 artefact/shell (AFT/SHL). None of these sites are within the Project Area.

The results of the site survey identified five sites (DW1 to DQ5), four isolated finds located on simple lower slopes and one low density artefact scatter (2 artefacts) along a 1st order stream (Lynch's Gully) within or near the Project Area. All sites were located within erosion areas and along tracks and were heavily disturbed with no subsurface potential. Soil horizon A had eroded at all locations with the B horizon exposed with poorly sorted conglomerate stone.

MCH confirmed that the results of the assessment indicated that the five sites (DQ1 to DQ5) would be impacted upon by the Project. Four of the sites are isolated finds and one site with two artefacts. All sites are highly disturbed, are well represented both locally and regionally and hold little to no research or scientific potential. The cumulative impact to Aboriginal heritage in the area as a result of the Project is limited.

Prior to the commencement of construction activities that will impact on sites DQ1 to DQ5, the Proponent shall provide for an appropriately qualified archaeological heritage consultant and registered Aboriginal stakeholders to collect any surface artefacts which would be affected by the construction of the SSD. The artefacts shall be lodged in a keeping place to be determined through consultation with the Aboriginal community. A Heritage Management Plan (HMP) will be developed in consultation with the registered Aboriginal stakeholders, the proponent and OEH and will detail how construction impacts on Aboriginal heritage will be minimised and managed.

Historic Heritage

A review of the relevant databases was undertaken to determine the presence of any items of non-indigenous heritage in proximity to the Project. The Muswellbrook Shire Council Local Environment Plan (LEP) has identified one historic heritage site in the proximity of the Project Area. The site is the Hollydeen Shop located approximately 2 km to the west of the Project Area. No other listed heritage items of relevance to the Project were identified. The potential for impacts to any items of non-indigenous heritage are considered very low. Site investigations did not investigate any suspected heritage items or areas of potential archaeological significance with the Project Area.

Visual Amenity

This assessment reviews the existing visual character of the site and its surrounds and the expected impacts of the quarry on the existing visual character of the surrounds, nearby existing residences and publicly accessible locations.

The visual character of the area predominantly consists of agricultural land, rural residences and mining operations. The site is surrounded by the Xstrata-operated Mangoola Coal Mine site to the north and east and by other cleared rural properties to the south and west.

The existing landscape has a rural character comprising rolling hills which are predominantly cleared, with a backdrop of vegetated rocky ridges and mountainous areas in the distance. The built environment comprises scattered rural residences and farm buildings. Other dominant visual features of the area include a number of local roads, such as Reedy Creek Road, Wybong Road, Rosemount Road, and the Golden Highway.

The proposed quarry is to be largely obscured from view from the main traffic and tourism flow along the Golden Highway between Denman and Sandy Hollow, due to the visual protection that will be

provided by the heavily timbered sandstone escarpment and ridge located between the proposed quarry and the highway. The proposed quarry would be located on the northern side of this natural barrier.

The assessment has found that landscape around the proposed development, generally has a high visual absorption capacity due to the existing terrain and the existing vegetation. This high visual absorption capacity corresponds directly with the generally low significance of impact to views from the Project. The proposed quarry would only be visible from a very limited number of areas because of topography and vegetation. These areas are located to the west and northwest of the site, but not from any residences. At any offsite public or private location where the proposed quarry is visible, the distance to the quarry and the small percentage of the quarry in the field of view suggest the visual impact would be very low.

Hazard and Risk

A hazard and risk assessment for the Project was undertaken in relation to the regulatory framework outlined by SEPP33. It is proposed to store only small quantities of diesel at the quarry and not to store explosive materials. The Project does not constitute hazardous or offensive development.

Socio-economic Assessment

The Project is expected to create positive economic benefits for the region in terms of employment creation, use of local goods and services, and the supply of quarried products at a competitive price to the growing upper Hunter and broader Newcastle Region. The potential for adverse social impacts is considered low.

The EIS has assessed the key aspects with potential to cause nuisance impacts. The Project is not predicted to present unacceptable impacts to local residents and the community. A variety of mitigation measures are recommended in this EIS that would be implemented as part of the Project to ensure that potential amenity impacts are minimised.

Positive social impacts will result from increased employment within the region. This would include direct employment of approximately 3-5 employees full time, as well as casual and contractor employment during construction and operation. Local businesses will benefit from use of local goods and services.

The agricultural assessment identified the Project area as having a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district. Further, the Project is not predicted to have any appreciable adverse impact on local equine and viticultural industries. Therefore, the Project is considered compatible with viticulture and equine industry.

Traffic and Transport

A traffic impact assessment was undertaken by Colston Budd Hunt & Kafes (2012) and is provided in **Appendix P**. This report examined the traffic implications of the proposed Project focusing on interactions with the Golden Highway.

The Project is located on the Golden Highway, some seven kilometres west of Denman. It is part of a rural land holding north of the Golden Highway, with the surrounding land use being primarily rural. In the vicinity of the site the Golden Highway provides a two lane two-way carriageway with sealed shoulders and a 100 kilometre per hour speed limit. Rosemount Road intersects Golden Highway near the site. It provides a two lane, two-way road which connects back to Denman. The intersection of Golden Highway with Rosemount Road is a t-intersection controlled by give way signs.

It is proposed to construct a new haul road with entrance approximately 100 m east of Rosemount Rd. The very low traffic volumes turning to and from the proposed new access road would not require special treatment at the intersection of Golden Highway. The intersection would operate at a good level of service, and there are good sight lines in both directions on Golden Highway.

Material extracted from the quarry would be carried by truck/trailer combinations and b-doubles, which carry some 33 and 39 tonnes each respectively. Based on an extraction rate of up to 250,000 tonnes per annum, and some 270 days operation per year, the proposed quarry would generate up to some 25 to 30 laden vehicles per day. Over a 10 hour working day, this is equivalent to some two to three trucks per hour (four to six movements two-way). It is likely that approximately 90% of movements would be eastbound along the Golden Highway.

Such a low traffic generation would not have noticeable effects on the operation of the surrounding road network. Turning volumes at the intersection of Golden Highway with the quarry access road would be less than the existing turning volumes at the Golden Highway/Rosemount Road intersection. The proposed access intersection would operate with average delays of less than 15 seconds per vehicle. This represents a good level of service.

Traffic from the proposed development is therefore not expected to result in any unusual safety issues at the intersection. A standard rural intersection is proposed where the haul road meets the Golden Highway. UHH proposes to consolidate the existing approved accesses to the Dolwendee property from three down to two which would likely be favourable to RMS and represent a positive impact on the road network.

Consultation with RMS would occur over the intersection design and any necessary approvals from RMS such as a Works Authorisation Deed (WAD) sought.

Waste Management

The Project has the potential to generate waste from quarry activities and general site use. The potential impacts of the Project have been assessed in regard to waste generation during the establishment, operation and closure of the quarry. The Project does not present any unusual waste management issues and is not likely to result in generation of large quantities of waste. Waste management does not present any significant challenges for the Project.

Greenhouse Gases and Energy

Greenhouse gas (GHG) emissions will result from activities associated with the Dolwendee quarry that consume energy. A GHG assessment was undertaken to estimate emissions of greenhouse gases and provide an interpretation of their impact. It was found that the quarry will contribute approximately 1,120 tCO₂-e of Scope 1 emissions per annum which is negligible and unlikely to prevent Federal Government achieving its national greenhouse gas objectives.

Rehabilitation and Closure

The final landform includes a closed void with a gently sloping quarry floor and benched quarry faces. The key objective would be to establish a stable landform that minimises risks to human and fauna safety and the environment.

The proposed final quarry batter faces would remain at a slope of 0.5 horizontal : 1 vertical. The height of these final faces would require review as the quarry develops, in conjunction with the Mines Safety Inspectorate. It is unlikely that the faces will have any vegetation on them as they will not be visible to neighbours, and the roots of plants can over time destabilise the stratum and make the faces unsafe. The quarry floor and/or benches would be rehabilitated if required to suppress dust.

Progressive rehabilitation of disturbed areas would be undertaken where appropriate, for example areas that are disturbed temporarily during construction but not required for operations. The rehabilitation plan would aim to return the pre-quarry environmental conditions where possible, which may include establishment of native vegetation or grassland suitable for agricultural purposes.

Vegetated safety berms and fencing would be established along the perimeter of the final benched quarry void.

Clean water diversion drains would be maintained above the final quarry void to divert and drain upslope runoff safely and in a non-erosive manner around the final quarry void. Drain channels and outfalls would be stabilised to prevent scour and erosion in accordance with the Blue Book.

A final Rehabilitation Strategy would be determined at a later stage as the quarry is closer to closure, approximately during stage 3 of development.

1. Introduction

Upper Hunter Holdings Pty Ltd (UHH) is proposing to establish a sandstone and conglomerate quarry on the property “Dolwendee”, near Denman in the NSW Hunter Valley (the “Project”).

The Project site is located within the Muswellbrook Local Government Area (LGA) approximately 20 km southwest from Muswellbrook and 7 km northwest from Denman.

1.1. The Proponent

The proponent for the Project is Upper Hunter Holdings (UHH) the owner of the subject lands.

1.2. Project Area

The Project Area for the purpose of this application is Lot 2 in DP 1160936 which contains the proposed quarry, with rights of access over lots 3 and 4 in DP 1160936 and Lot 1 in DP1178562 for the proposed haul road, which are all owned by UHH. .

1.3. The Project

The Project involves the proposed construction and operation of a conventional quarry operation with an active extraction area (limited to approximately 10.5 hectares), raw material and product stockpiles, crushing and screening plant, and a small office, amenities and car parking space. An internal haul road approximately 2.5km long would connect with the Golden Hwy near Dolwendee Homestead.

The Project targets the staged extraction and processing of conglomerate and pebbly sandstone to produce a range of crushed products including select fill, road and railway base and mine blast-hole stemming. The total resource targeted for extraction is approximately 5.3 million tonnes. The estimated extraction rate is up to 250,000 tonnes/year and provides for over a 21 year extraction period.

1.4. Environmental Impact Assessment Process

Although relatively small in scale the Project nonetheless meets the definition of State Significant Development (SSD) as it is an extractive industry that proposes extraction from a total resource exceeding 5 million tonnes. The Project is identified as SSD_6519 and is to be assessed by the NSW Department of Planning and Environment (DP&E).

Approval is sought for this State Significant Development (SSD) under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Division 4.1 provides for development to be declared SSD either by a State Environmental Planning Policy (SEPP) or by order of the Minister. The Minister is generally the consent authority for SSD.

Under clause 8 of the *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP), development is declared to be SSD for the purposes of the EP&A Act if, among other provisions, the development is specified in Schedule 1 or 2 of the State and Regional Development SEPP.

Under Section 78A of the EP&A Act an application for SSD must be accompanied by an Environmental Impact Statement (EIS). In accordance with *the Environmental Planning and Assessment Regulation 2000*, the Secretary is to issue environmental assessment requirements (SEARs) in relation to the proposed statement and the EIS must be prepared in accordance with these requirements. Following a test of adequacy, the EIS is placed on public exhibition for a period of not less than 30 days and the applicant must give consideration to submissions made. A submissions

report may then be prepared by the applicant for assessment by the DP&E with a recommendation for determination. The SEARs for the proposed Project are provided in **Appendix A** of this EIS.

1.5. Purpose of this Report

This EIS report has been prepared by KMH Environmental Pty Ltd (KMH) on behalf of UHH to accompany the SSD application for the proposed Project.

This EIS has been prepared pursuant to the SEARs for the project originally issued on 24 June 2014 and later updated and re-issued on 22 April 2015. A copy of the SEARs is included in **Appendix A**. The SEARs were compiled in accordance with the requirements in Clause 6 and 7 of Schedule 2 of the EP&A Regulation. **Appendix B** provides a table summarising the SEARs and identifying where in the EIS these are addressed.

The purpose of this EIS report is to:

- Provide a comprehensive description of the project and the lands affected;
- Assess the potential environmental impacts of the Project on the physical, social and economic environment (having regard to both current and future land use);
- Identify management and mitigation measures to be implemented to minimise potential impacts associated with the Project; and
- Justify the proposed Project, including suitability of the Project site and its alignment with whether the proposed Project is in keeping with public interest.

The key recommendations and management measures described in the report have been included in **Chapter 7**. They would form a key component of any conditions of approval issued for the Project.

1.6. Structure of this Report

An outline of the structure and content of this report is included in **Table 1**.

Table 1 EIS structure

Chapter	Content
Chapter 1 Introduction	Project background, information about the proponent, location, planning history and environmental assessment requirements.
Chapter 2 Site Overview	Description of the project site and surrounding area
Chapter 3 Project Description	Detailed description of the Project including the need for the Project and alternatives considered
Chapter 4 Statutory Planning Framework	Consideration of the relevant statutory provisions and planning pathway
Chapter 5 Consultation and Issues Identification	Summary of consultation undertaken with Government agencies, stakeholders and the community
Chapter 6 Environmental Impact Assessment	Detailed assessment of the potential impacts of the Project for a range of key environmental aspects
Chapter 7 Management Measures	Consolidated summary of recommended management and mitigation measures
Chapter 8 Conclusion	Conclusion to the EIs including key findings
Appendixes	Supporting documentation including the technical specialist reports

1.7. Project Team

UHH engaged KMH Environmental Pty Ltd to manage a number of technical specialists and prepare this EIS for the proposed Project. A list of the technical specialists and their role is provided in **Table 2**. The various technical reports produced by these specialists are provided in Appendixes to this EIS.

Table 2 EIS project team

Role	Organisation Responsible	Location of Specialist Report in this EIS
Proponent	Upper Hunter Holdings Pty Ltd (UHH)	n/a
EIS preparation including various technical assessments	KMH Environmental Pty Ltd	n/a
Agricultural assessment	Ross Watson Agriculture P/L of Scone	Appendix D
Resource Description / assessment	RCA Australia	Appendix E
Geotechnical Investigation report	RCA Australia	Appendix F
Extraction Operations Plan / Quarry Design	VGT Pty Ltd	Appendix G
Drill and blasting assessment	Peter Bellairs Consulting	Appendix H
Surveyors	Boardman Peasley / Fyfe	Appendix I
Conceptual Haul Road Design	RHM Consulting Engineers	Appendix J
Ecology assessment	Umwelt	Appendix K
Air Quality assessment	Todorski Air Sciences	Appendix L
Noise and vibration assessment	Muller Acoustic Consulting	Appendix M
Groundwater assessment	RCA Australia	Appendix N
Aboriginal Heritage assessment	McCardle Cultural Heritage	Appendix O
Traffic Impact assessment	Colston Budd Hunt & Kafes Pty Ltd	Appendix P

2. Site Overview

This chapter provides an overview of the Project location and regional context, and a description of its general physical characteristics. The chapter also outlines the surrounding land uses in order to provide an understanding of how the project fits within the regional and local context.

2.1. Location

The Project is located within the Muswellbrook LGA on the northern side of the Golden Highway approximately 20 km southwest from Muswellbrook and 7 km from Denman in the NSW Hunter Valley. **Figure 1** depicts the Project location.

2.2. Site Description

The Project occurs on rural lands that have been largely cleared, and have historically been used for cattle and sheep grazing. The property contains some patches of remnant and regrowth native vegetation. The largest intact area of native vegetation is associated with a prominent rocky ridge, to the south of the proposed quarry disturbance footprint.

The local topography is characterised by gentle rises and slopes, though is dominated by a prominent horseshoe-shaped hill and sandstone ridgeline would not be impacted by the project. The proposed quarry footprint is located on the northwest facing slopes to the north of this ridgeline. The landscape is relatively stable with only minor localised areas of sheet erosion evident.

The property drains to Wybong Creek (a tributary of Goulburn River) which is located approximately 1km west of the Project. An intermittent watercourse known as Lynch's Gully occurs in the southern part of the property and drains westwards to Wybong Creek. Lynch's Gully displays some gully erosion and has been the subject of soil conservation works in the past. The nearest watercourse downstream of the proposed quarry is further than 400 m away.

Figure 2 shows the location of the project Site including surrounding land uses and regional context.

Appendix C contains photographs describing the Project site and surrounds. In particular, **Photographs 1-5** show the potential views to and from the proposed quarry from a number of key locations. **Photographs 14-18** describe the landscape of the proposed quarry and surrounds.

2.3. Current and Historical Land Use

The Project area was historically cleared for agriculture. It is unknown exactly when clearing occurred, but regrowth trees to 30cm diameter at breast height (dbh) exist on the site, indicating the event was not recent. Additionally, trees from the original structured vegetation community were retained (greater 80cm dbh), presumably for livestock shade. The adjacent hillside supports structurally intact native vegetation (The Envirofactor, 2008). This area is still used for grazing purposes.

A report on the agricultural capability of the land was prepared by consulting agronomist Ross Watson, and is provided in **Appendix D**. The report concludes that the area of the proposed quarry is of low agricultural capability (Class 4 and 5 agricultural land). It comprises slopes with skeletal soils used historically for low intensity cattle and sheep grazing. Productive agricultural areas do occur on an adjoining property (i.e. the Class 2 and 3 agricultural land associated with the creek flats of Wybong Creek) though are not involved in this proposed development and would not be impacted or rendered inaccessible by the Project. Some of these more productive lands along the alluvial flats and lower slopes adjacent the Wybong River have a history of cropping and viticulture, but such activities have never been undertaken within the Project Area.

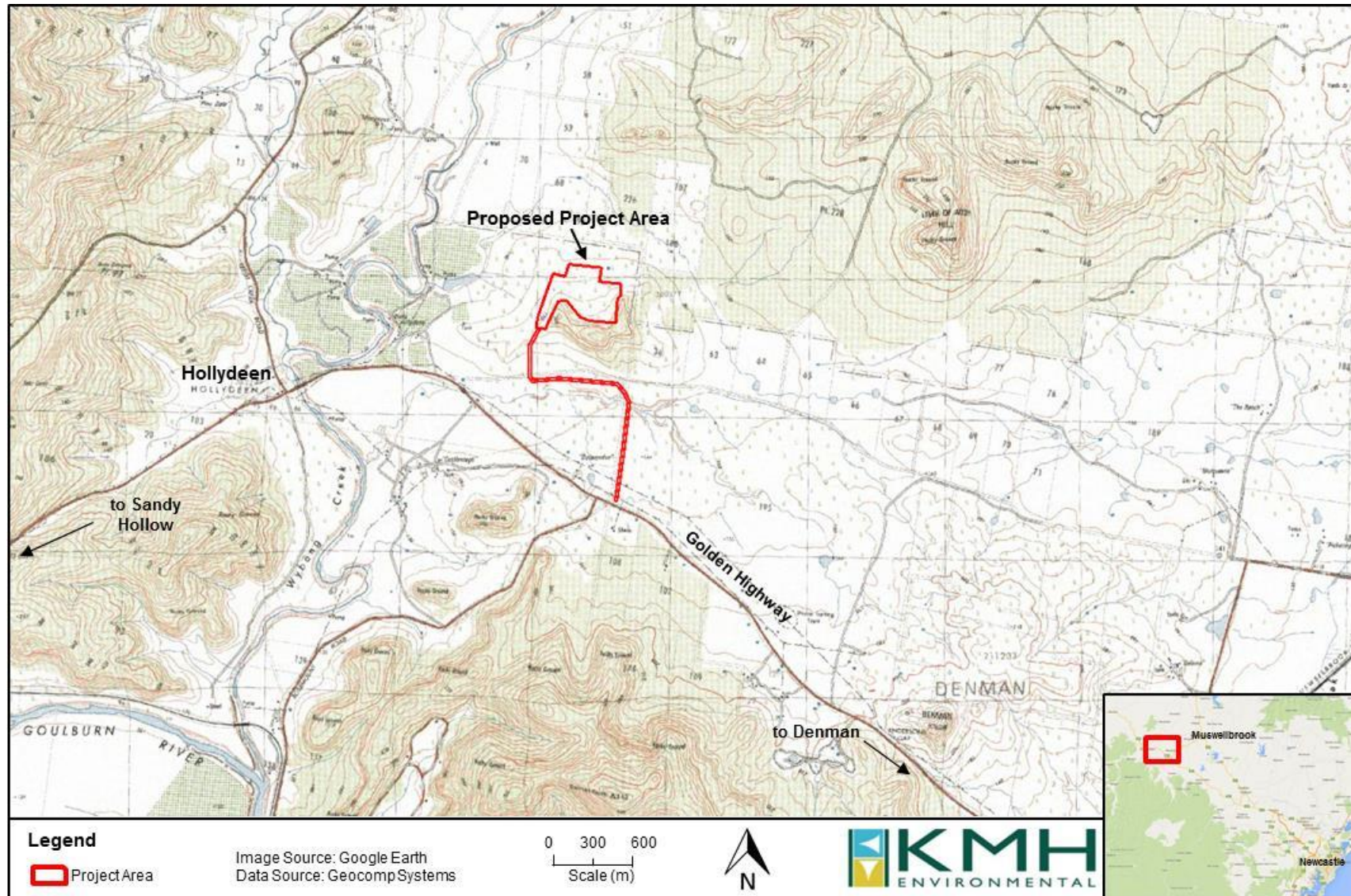


Figure 1 Project Location

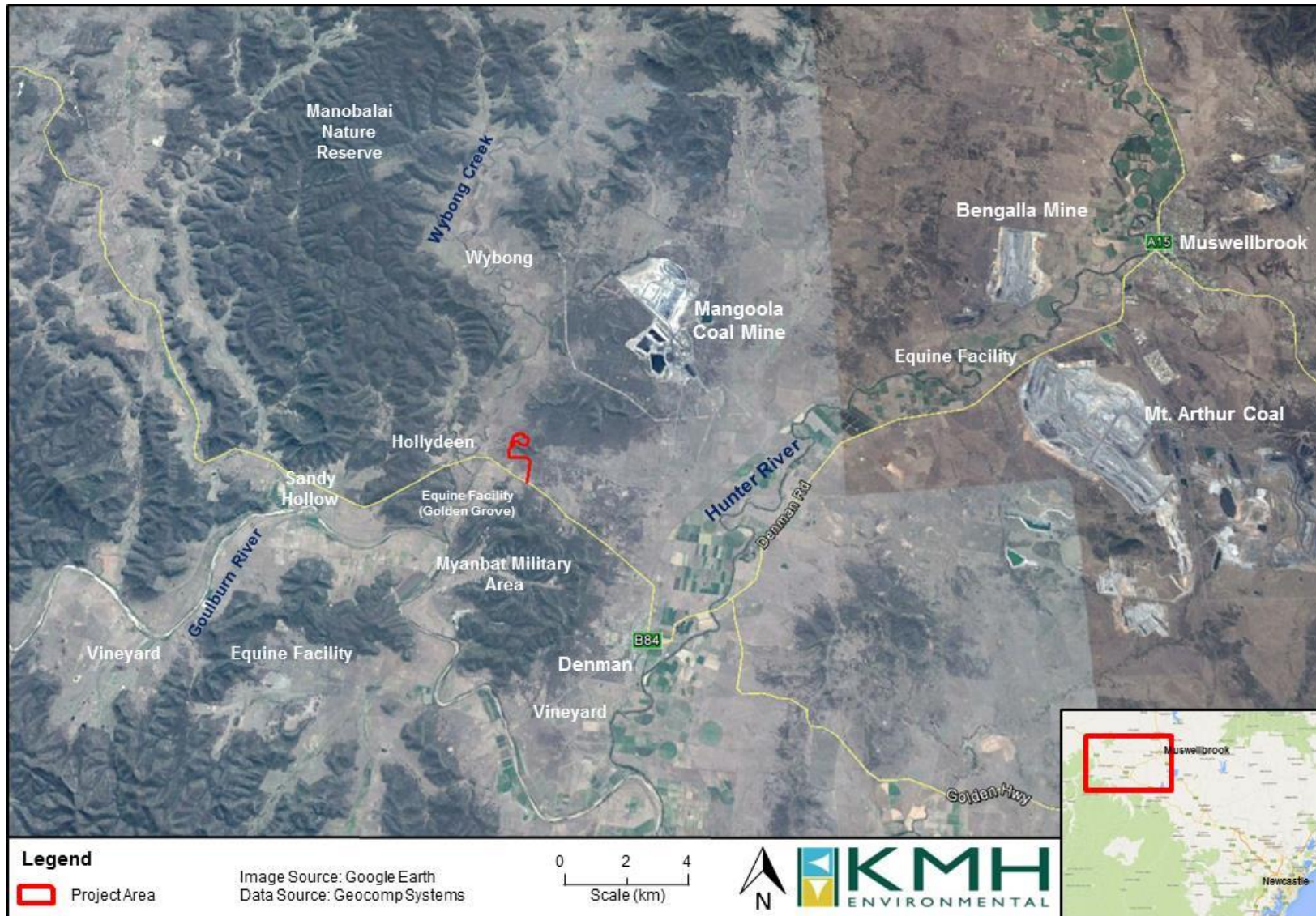


Figure 2 Regional Context

2.4. Regional Context and Surrounding Land Uses

2.4.1. Catchment Description

The Project Disturbance Area is situated in the Upper Hunter Valley, NSW. It lies within the 22,000 square kilometres Hunter River catchment which is drained by the Hunter and Goulburn Rivers and their tributaries. The Project Disturbance Area is situated approximately 125 kilometres from the coast.

The Project Disturbance Area occurs in the Hunter Catchment Management Authority (CMA) area and specifically within the Hunter/Central Rivers Kerrabee Catchment sub-region. It is characterised by rolling hills with a mixture of remnant grassy woodlands and derived native grassland. However, steep hills with areas of escarpments also occur in the vicinity of the site.

The Site drains to Wybong Creek approximately 900 m west of the Project Area. Wybong Creek supports floodplains which contain the more fertile lands within the Wybong valley. Wybong Creek is a tributary of the Goulburn River.

2.4.2. Neighbouring Land uses

The Project is surrounded by other cleared rural properties to the south and west, and is adjacent to the Glencore-operated Mangoola Coal Mine site to the north and east.

The proposed quarry is relatively distant from neighbouring rural residences. There are a number of residences to the south and west of Dolwende on the southern side of the Golden Highway, the closest being approximately 1.5km from the proposed quarry. Several of these neighbouring residences are relatively close to the proposed haul road intersection with the Golden Highway which is about 100 m east of the Rosemount Road intersection.

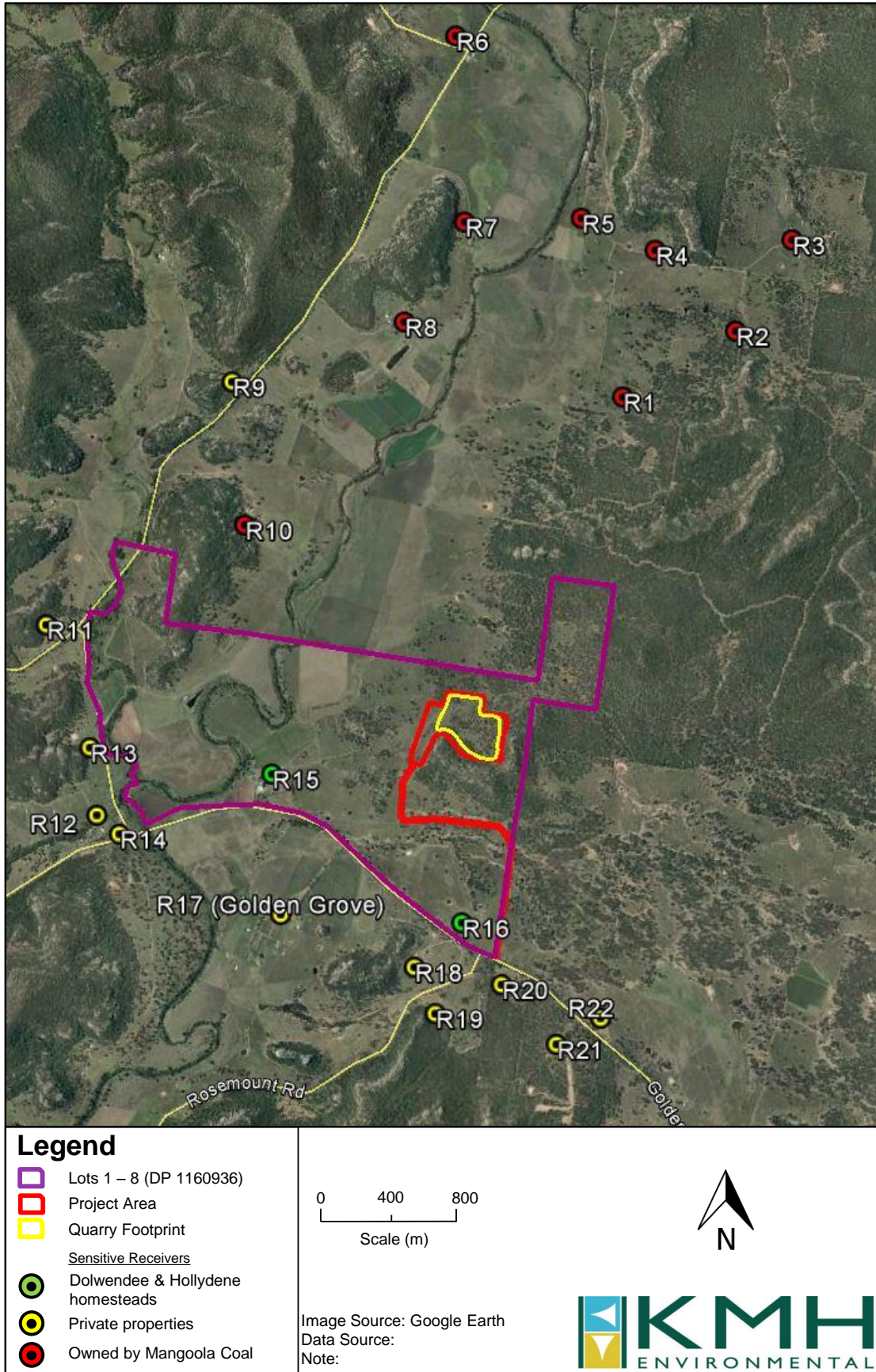
There are a small number of rural residences approximately 2km to the west of the Project in the vicinity of the Hollydeen shop, on the corner of Reedy Creek Road and Golden Highway. A number of more distant residences occur to the north, further up the Wybong Valley. The nearest neighbouring residences to the north and east have been acquired by Xstrata Mangoola Coal as buffer lands or for biodiversity offsets. Vineyards and equine facilities are scattered across the wider region of the Muswellbrook LGA including areas near Sandy Hollow, Wybong and Denman.

Figure 3 indicates the Project context in relation to surrounding properties and offsite residential receivers.

2.4.3. Conservation Areas

Two large national parks are situated approximately 14 kilometres to the south of the Project Disturbance Area (Wollemi and Yengo National Parks) and Goulburn River National Park is situated approximately 15 kilometres to the west. These National Parks contain large areas of native vegetation and offer a wide range of good quality fauna habitats. A smaller, yet significant conservation area also exists approximately eight kilometres to the north-west of the Project Disturbance Area (Manobalai Nature Reserve, refer **Figure 2**). This conservation area also contains significant areas of remnant vegetation and important fauna habitats. These conservation areas will not be adversely affected by the Project.

Adjoining the wider study area to the east is a dedicated biodiversity offset site for the Mangoola Coal Mine (Umwelt 2006). The dedicated biodiversity offset area is approximately 1924 hectares in size and includes 1074 hectares of intact woodland or forest vegetation.



Source: Google Earth

Figure 3 Site Context in relation to Sensitive Receivers

2.4.4. Climate

The mean annual rainfall for the locality is approximately 600 mm with the majority of this falling in the period between October and March. Mean daily maximum temperatures range between 16.5 °C in July to 31.4 °C in January. Mean daily minimum temperatures range between 3.4 °C (July) and 16.8 °C (January).

Table 3 displays the climatic data compiled from several nearby Bureau of Meteorology gauging stations.

Table 3 Climate Statistics

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)¹	77.7	72.7	50.9	38.3	37.5	40.6	37.5	35.7	40.8	51.8	60.3	72.4	616.2
Mean Max Temp²	31.4	30.3	27.8	24.4	20.2	17	16.4	18.7	22.1	25.1	27.9	29.8	24
Mean Min Temp²	16.8	16.5	14.1	9.9	6.6	4.7	3.4	3.6	6.7	9.4	13.1	15.2	10
Mean Daily Evaporation (mm)³	7.1	6.2	5	3.5	2.2	1.6	1.8	2.7	3.9	5.1	6.1	7.1	4.4

¹ Sandy Hollow (Gouldburn Drive) Bureau of Meteorology (BOM) station

² Scone Airport AWS BOM station

³ Scone SCS BOM station

3. Project Description

3.1. Property Details and Ownership

The Project occurs within a rural property known as “Dolwendee”, comprising Lots 1, 2, 3 and 4 in DP1160936 and Lot 1 in DP1178562. The proposed quarry footprint would be located on Lot 2 (refer **Figure 3**). The property Dolwendee is owned by the Proponent UHH.

It is relevant to note that the Dolwendee property is part of a relatively recent 8-lot subdivision approved by Muswellbrook Council. Lots 5 to 8 in DP1160936 are known as “Hollydene” and are owned by United Pastoral. UHH and United Pastoral have some common ownership.

Hollydene is the nearest potentially affected neighbour to the Project and is in full support of the Project. Since acquiring the land in 2008, Lots 1-8 have been managed for the most part as a single landholding, with a resident farm manager overseeing the agricultural enterprises across all lands.

3.2. Project Area

The Project Area for the purpose of the SSD application is located on Lots 2, 3 and 4 in DP 1160936 and Lot 1 in DP 1178562 and is depicted in a set of plans prepared by the project surveyors, FYFE Partners, and provided in **Figure 4**, **Figure 5** and **Figure 6**.

The Project Area encompasses all lands expected to be disturbed by the Project during its construction and operation and includes:

- Quarry and Processing Area – all lands required for establishment and operation of the quarry, processing area, raw material and product stockpiles, overburden stockpiles, crushing and screening plant, and a small office, amenities and car parking space (totalling approximately 10.5 hectares), located on Lot 2 DP 1160936;
- Haul Road – an internal haul road approximately 2.5 km long in a corridor 20 m wide, which traverses (in order from the Golden Highway intersection) Lot 1 DP1178562, then Lot 3, Lot 4 and Lot 2 in DP 1160936 on the Dolwendee estate.

Figure 3 shows the position of the Project on an aerial image of the area, including approximate locations of the nearest potentially sensitive receivers (mainly rural residences) and the location of the Dolwendee homestead.

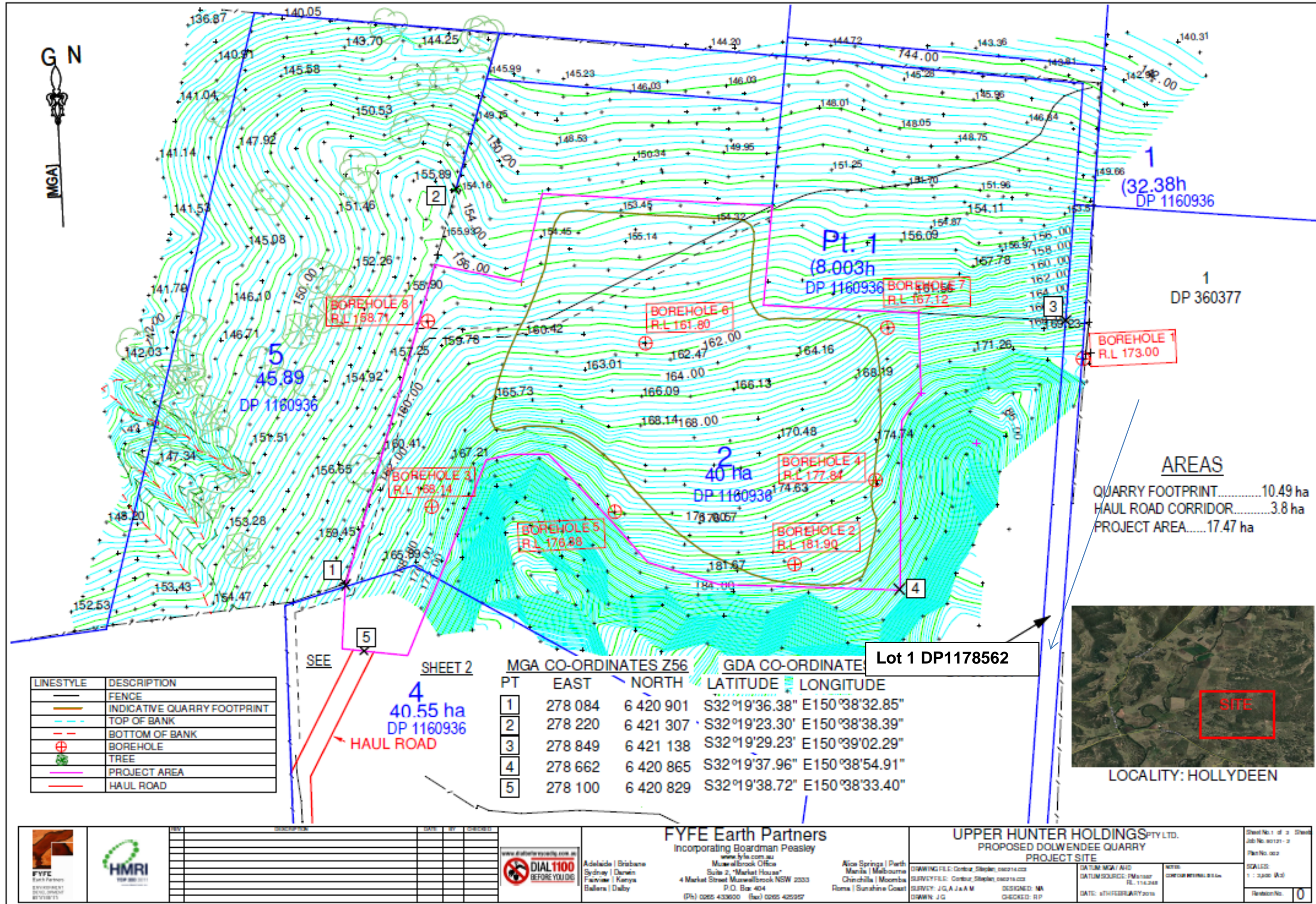


Figure 4 Project Area Plan A

Source: FYFE Partners

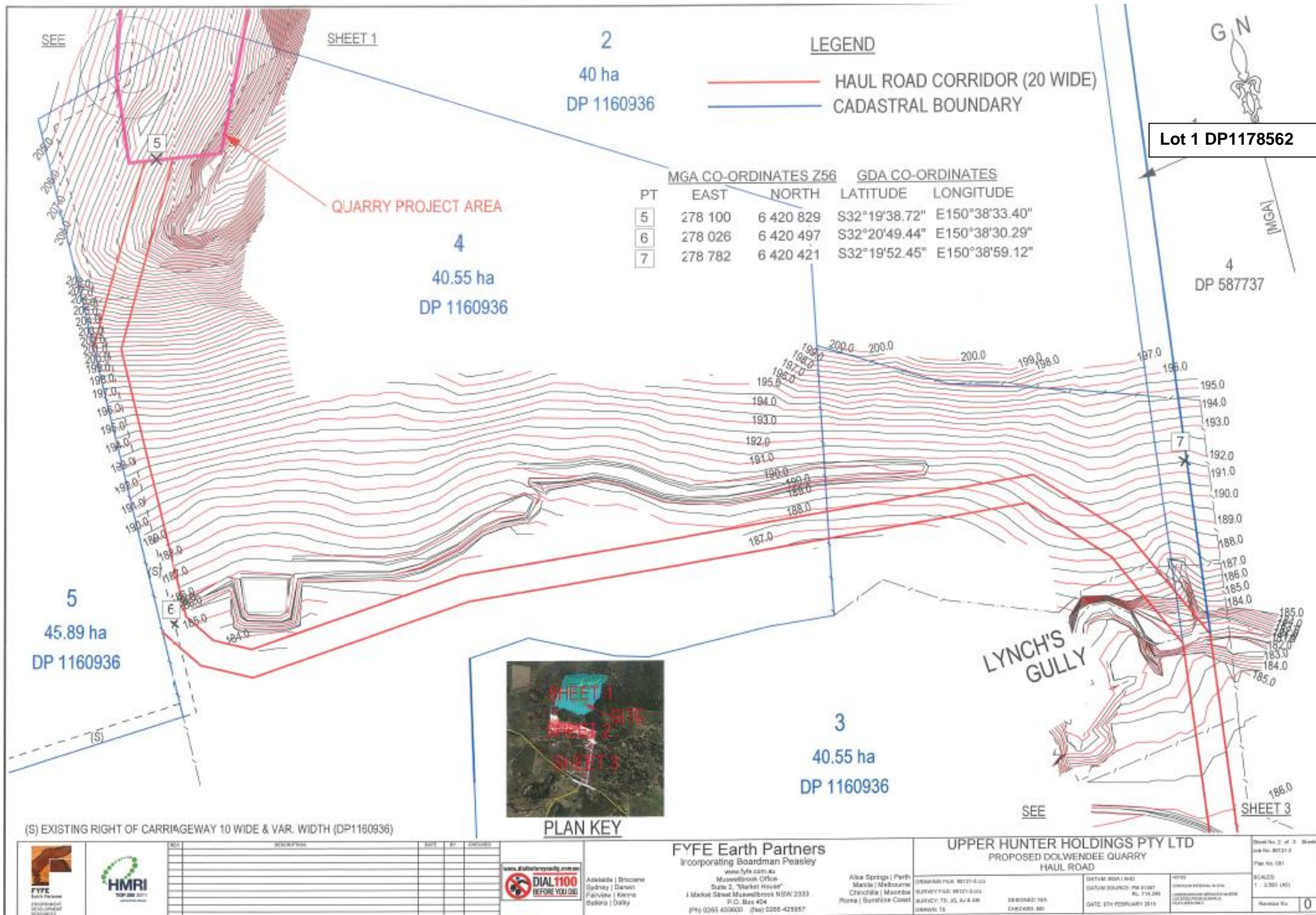


Figure 5 Project Area Plan B

Source: FYFE Partners

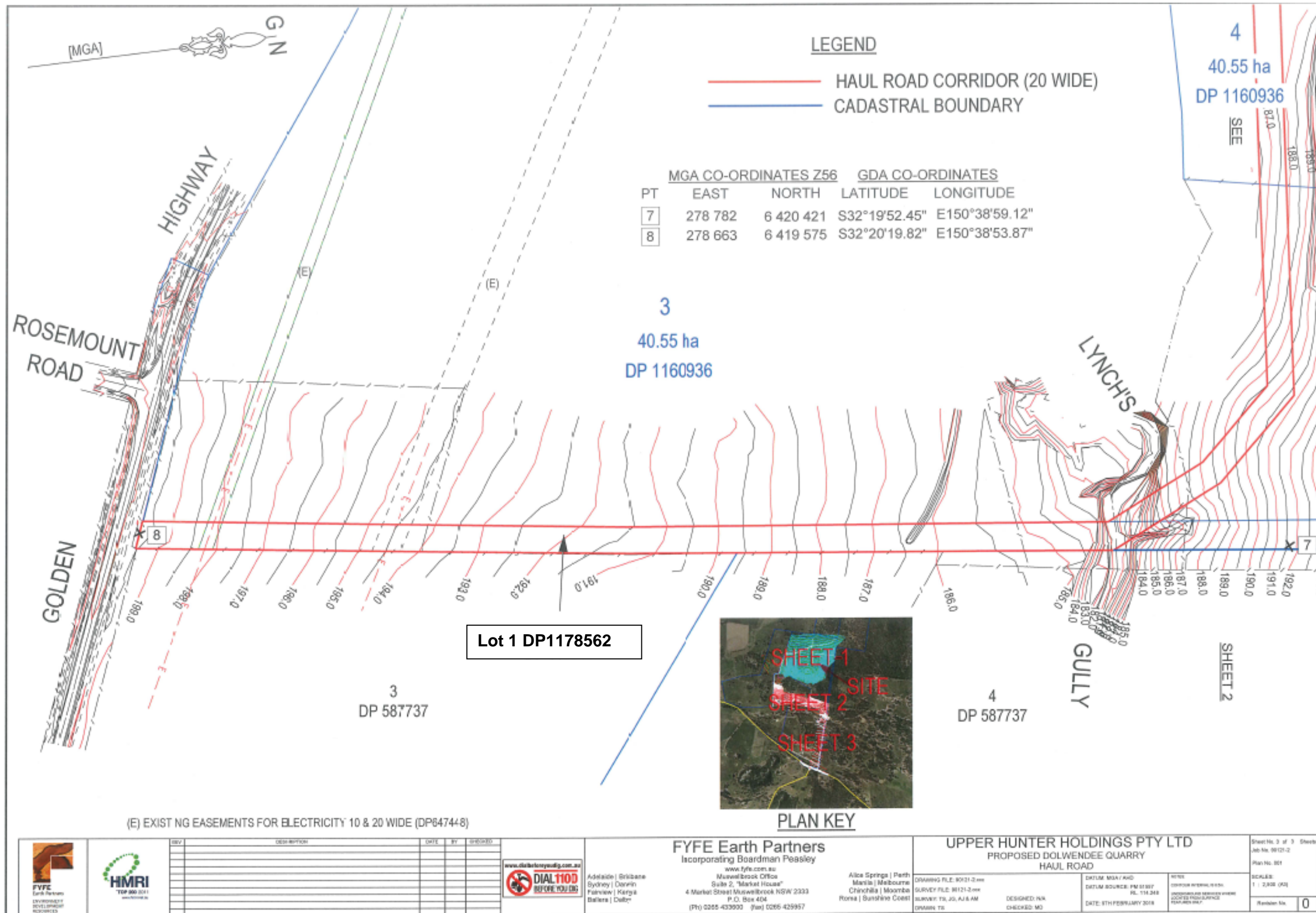


Figure 6 Project Area Plan C

Source: FYFE Partners

3.3. Resource Description

Extensive geological testing has been undertaken by RCA Australia to assess the extent and nature of gravel resource and its suitability for production of a range of construction materials. This testing has been undertaken in several phases and is summarised in the following key RCA documents:

- RCA document ref: 9325-101 July 2012 – presented the results of drilling four cored boreholes (BH1-4) in the proposed quarry area drilled to depths ranging from 27.15 to 30m and a preliminary material appraisal.
- RCA document ref: 9325.1 September 2012 - presented the results of laboratory CBR and Atterberg Limits tests on a single sample of crushed core from each of the four boreholes and a preliminary material assessment of the laboratory test results against RMS QA 3051 Specification for Granular Base and Sub-base Materials for Surfaced Road Pavements.
- RCA document ref: 9325-201/1 April 2014 - presented a preliminary resource estimate based on an indicative quarry footprint and the results of previously completed cored boreholes BH1 to BH4. This resource estimate determined that a resource in excess of 5.3 million tonnes exists at the site and is capable of extraction. A copy of this preliminary resource assessment is provided in **Appendix E**.
- RCA document ref: 9325-202/1 August 2014 - presented the results of laboratory CBR and Atterberg Limits tests on two bulk soil samples from each of the D6 dozer 'costeans' TP1 to TP3. Two bulk soil samples were collected from each test 'costean', for a total of six samples. The results of laboratory CBR and Atterberg Limits tests on these samples were compared to the ARTC Standard ETM-08-01 for Earthworks, Formation and Capping Material.
- RCA document ref: 9325-203/0 Draft August 2015 – presented the results of additional site investigations, borehole drilling, material testing and assessment against a range of construction materials specifications. Fieldwork included geological measurement of rock mass defects exposed in rock outcrops along ridge lines adjacent to the eastern and southern extents of the proposed quarry. Four additional boreholes (BH5 to BH8) were drilled to depths of between 41m to 61.5m and groundwater wells installed in these boreholes for subsequent monitoring. Rock core was collected from all four boreholes for extensive laboratory material assessment. A copy of this geotechnical investigation report is provided in **Appendix F**.

The investigations conducted by RCA confirm the site is underlain by a sequence of conglomerate and pebbly sandstone with occasional lithic sandstone layers which extends to at least the indicated depth of proposed 30m deep quarry. This conglomerate and pebbly sandstone is the resource targeted for extraction.

Materials were tested to a broad range of material specifications in use in the local area and a detailed summary of the material assessment is contained in **Appendix F**. In summary, it was found that the quarried materials may be processed by crushing, screening and blending, as required, to provide materials meeting a range of different specifications:

- Based on this comparison of quarry sample test results to RMS QA 3051 and AUS-SPEC C242 and 1141 Flexible Pavement Specifications, crushed conglomerate (blended with minor amounts of sandstone) would be expected to produce pavement material suitable for unsealed rural roads; crushed conglomerate/minor sandstone would be expected to produce a sub-base material suitable for sealed rural roads; and crushed conglomerate/sandstone would be expected to produce good unsealed hardstand type pavement material;
- Based on comparison of test results to the ARTC Standard ETM-08-01 for Earthworks, the resource geotechnical units are likely to yield a high percentage of material suitable for use as structural fill and capping material in accordance with ARTC specifications.

- Based on grading tests the soil profile could yield up to 21%, but typically 11% by mass of stemming gravel;
- Based on grading tests the crushed rock is likely to yield 17%-37%, average 31% by mass of stemming gravel.
- It is likely that the finer material produced from crushing of conglomerate/sandstone rock could be processed to meet pipeline trench back fill requirements for drainage works.

The initial operations are expected to focus on production of a small range of crushed products that require minimal processing or blending. These include a 7-14mm material suitable as road sub-base, and a 14-20mm material suitable for mine blast hole “stemming”. The processed products will include:

- 7mm minus
- 14 -7 mm
- 20 mm plus
- Fill and select fill

A wider range of products may be developed in the future depending on material suitability, local demand and economic factors.

3.4. Resource Estimate

The RCA (2014) resource estimate report (**Appendix E**) adopts a preliminary Stage 1 quarry footprint, developed based on environmental constraints which include restricting the quarry footprint to Lot 2 and avoiding encroachment into the prominent rocky ridge to the south. Preliminary plan and cross-section drawings of a conceptual quarry were developed for the Stage 1 area for the purpose of resource estimation. The conceptual quarry design shown in drawings 1 to 4 in RCA (2014) (**Appendix E**) provide plan and cross-section drawings of the Stage 1 quarry used for resource estimations. The preliminary resource estimate exceeded 6 million tonnes.

Subsequent to the initial RCA resource estimate, VGT Environmental prepared a detailed quarry plan that refined the quarry footprint, geometry and staging. The VGT Quarry Plan is provided in **Appendix F**. The quarry plan examines three stages of development including the proposed final landform.

Based on the VGT quarry plan the total volume of the deposit target for extraction is 2,295,000 cubic metres or 5,319,800 tonnes. This estimate is based on the results of density testing by RCA indicating the average core density is 2.318 Tonnes/m³.

Of this, the overburden of soil and sub soil is assumed to be approximately 0.5 metres thick creating 52,450 cubic metres of soil. The target resource is considered to be part of a much larger sandstone and gravel resource expected to extend laterally well beyond the currently proposed extraction area.

The assessment confirms an indicated resource exceeding 5 million tonnes within Lot 2, which would be targeted for extraction under the Project. Consequently the Project meets the definition of State Significant Development.

3.5. Extraction Rate and Quarry Life

UHH seeks approval to extract and transport to market an average of 250,000 tonnes of extractive material per year. The extraction rate is expected to fluctuate according to demand for product.

Based on the current indicated resource size of approximately 5.3 million tonnes, the proposed quarry provides for a greater than 21 year extraction period. The quarry life may exceed 21 years if the achieved extraction rates are less than predicted.

Should further exploration identify additional resource, the quarry life could extend well beyond this subject to obtaining any necessary additional approvals.

3.6. Quarry Description

The proposed quarry is to be a conventional open cut operation with an active extraction area (approximately 10.5 hectares), raw material and product stockpiles, crushing and screening plant, and ancillary facilities including a small office, workshop, amenities and car parking space. An internal haul road approximately 2.5 km long would connect the quarry to the Golden Highway. The quarry activities (excluding product haulage) would be confined to the Project Area defined in **Figure 4**. A conceptual layout of the quarry is provided in **Figure 7**. It is anticipated that the processing area may relocate throughout the Project Area several times throughout the quarry life to meet operational requirements and efficiencies. **Figure 7** shows a potential worst case scenario for the processing plant which is at the western side of the total Project Area, closest to sensitive offsite receivers and outside the quarry footprint.

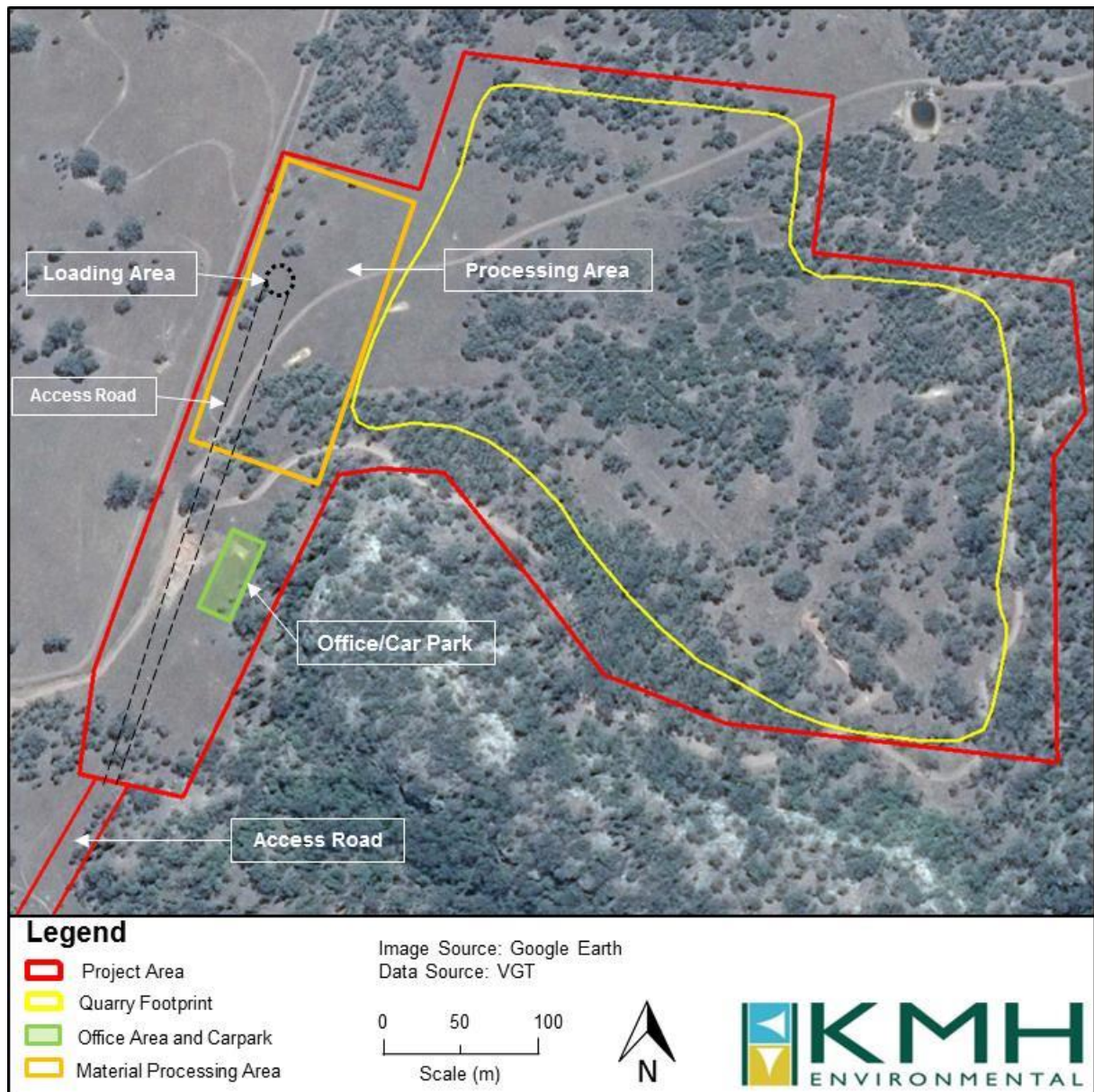
The quarry staging would be planned to minimise environmental impacts during all stages of its operations; for example, by limiting quarry-related disturbance to only approved areas, minimising forward stripping of topsoil and overburden, locating noisy and dust-generating plant so as to minimise noise and dust impacts, and implementing necessary stormwater controls prior to major disturbance.

A crushing and screening plant would be provided to produce the desired aggregates. The use of mobile diesel powered crushing/screening plant is being investigated to enable the plant to be located close to the extraction face, and so provide maximum machine productivity and output. In this case the excavator would load the crushing plant directly.

Should fixed crushing and screening plant be favoured, a front end loader (FEL) and off road trucks will be used to transfer product from the extraction face to the crusher hopper. The FEL will also move finished products from screens into stockpiles and attend to loading out trucks on demand. In the event the loader has numerous trucks to load out, the excavator can walk to the crusher and continue to load the hopper to keep production going through the system. The intention is to schedule truck movements and loading times as far as practicable to optimise efficiency of operations and reduce plant movements.

There is no provision for a weighbridge at this stage as the trucks will be loaded by a loader with scales. A wheel wash is also not required as a portion of the haul road adjacent the Golden Highway will be sealed.

At the end of the day time will be allocated for maintenance checks and greasing of machinery along with general housekeeping of the yard. A water cart is proposed for dust suppression.



Source: FYFE Partners

Figure 7 Conceptual Quarry Layout

3.7. Quarry Staging

An extraction operations plan (**Appendix G**) was prepared by VGT Pty Ltd that describes in detail the conceptual staging of quarry development over the life of the Project. **Figure 8** describes the conceptual development of the quarry outlining three key stages from commencement to complete development of the quarry void.

The following sections summarise how the quarry operation will progress in concept; however, it is expected there will be changes as the quarry develops, and the timeframe would be dependent upon weather and sales demand. This evolution would come as a better understanding of the geology and geotechnical nature of the deposit reveals itself to the operators.

The safety of all those working on the site is paramount to the design and operation of the quarry and it is expected that quarry plans will be modified and improved in conjunction with the Mine Safety Inspectorate.

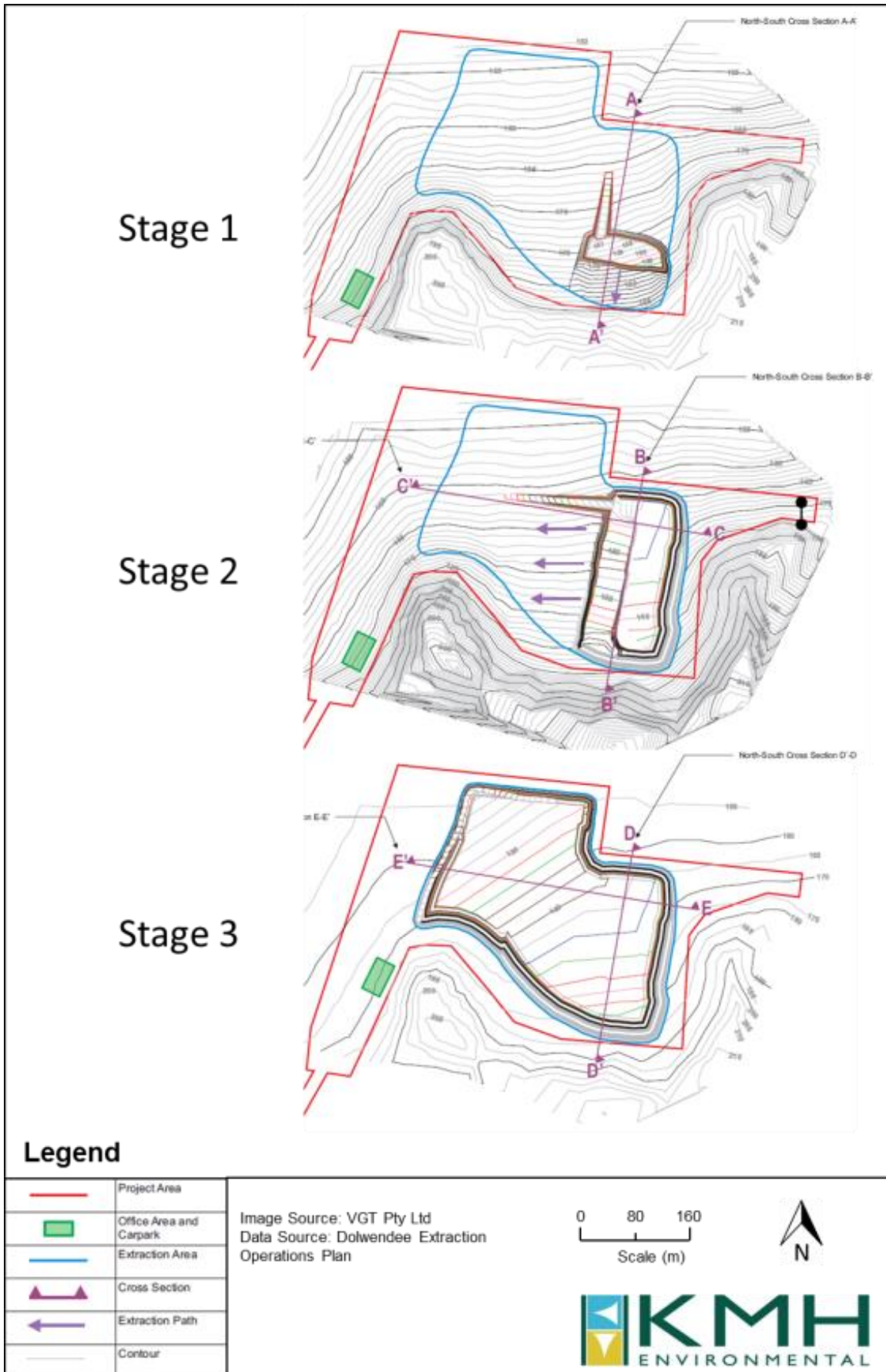


Figure 8 Indicative Quarry Staging

Environmental controls including environmental protection fencing, clean water diversion drains, sediment basins and dirty water drains would be installed prior to the commencement of stripping.

3.7.1. Stage One

This stage will occur between 12 and 24 months of commencement.

Trees will be removed using an excavator and some trees will be cut and used as fence posts if required.

The soil will be stripped in two stages. The first strip will scrape the upper 10 centimetres of topsoil and store it as seed bank topsoil to be used for revegetation. This topsoil material will be stockpiled separately and managed to enable later use in rehabilitation as required.

The next strip will occur nominally down to 0.5 metres below the surface. This sub-soil will be used to create bunds where required around the site, which will include the safety berm above the high wall and clean water diversion berms where required. Sediment basins would be constructed as required prior to stripping and exposure of soil.

The pre-strip activities will be undertaken using a D9 dozer or equivalent. The softer weathered zone is expected to be on average 2.5 metres below the surface. This interval would be battered back to 2 horizontal to 1 vertical. The dozer would rip down to this level until the dig becomes too hard at which time the site would be prepared for blasting. Note that the geotechnical assessment (**Appendix F**) contains an excavatability assessment which indicates up to 1/3 of the total resource depth could be excavated by very hard ripping using a D9 or equivalent dozer to extremely hard ripping using a D11 or equivalent dozer; whilst the remainder will require drill and blast

The first blast would be a box cut blast as described in the Blast Assessment (**Appendix H**). As part of cut development, a ramp would be constructed so that haul trucks could access the quarry floor. A 30 tonne excavator (or similar) would load 25 tonne haul trucks (or similar) which would cart raw material to the processing area.

The high wall batters will be a maximum of 15 metres based upon the blast design parameters (to be reviewed by geotechnical consultants). The batter slope is proposed to be 0.5 horizontal to 1 vertical as specified in the extraction operations plan (**Appendix G**).

From the time of early development the quarry will be internally draining, ensuring containment of potentially sediment-laden stormwater runoff from working areas and greatly minimising the risk of offsite discharge of sediment. Sediment basins would be established as required within the quarry floor to manage internal drainage and contain dirty stormwater, which would be reused for dust suppression and other quarry-related activities.

3.7.2. Stage Two

This stage would occur approximately 5 years from commencement.

During this period the active face would turn 90 degrees and align it north – south and the blast would throw material toward the east. The active blast bench would have an approximate slope of 12 horizontal to 1 vertical, toward the north approximately paralleling the existing topography.

The blast face would progress in a westerly direction with the possible ramp location following an east – west direction.

As the extraction progresses deeper the rock is expected to become harder, blast design and high wall stability would be re-examined to ensure the faces are stable and the fragmentation is appropriate for the products being developed.

The proposed quarry batter faces would remain at a slope of 0.5 horizontal to 1 vertical. The height of these final faces would require review as the quarry develops. It is unlikely that the faces will have any vegetation on them as they will not be visible to neighbours, and the roots of plants can over time destabilise the stratum and make the faces unsafe.

The quarry floor may be rehabilitated as required to suppress dust.

3.7.3. Stage Three

This stage would occur approximately 15 years from commencement.

During this period the quarry path would continue in a westerly direction.

The proposed quarry batter faces would at this stage remain at a slope of 0.5 horizontal to 1 vertical. The height of these final faces would require review as the quarry develops, in conjunction with the Mines Safety Inspectorate. It is unlikely that the faces would have any vegetation on them as they will not be visible to neighbours, and the roots of plants can over time destabilise the stratum and make the faces unsafe.

The quarry floor could be rehabilitated if required to suppress dust.

3.7.4. Quarry Closure and Rehabilitation

The detailed list of proposed mine closure activities are found in **Section 6.19**. The final landform rehabilitation plan would be determined in detail as the quarry operations are closer to closure, at stage 3 of development when there is a better understanding of the in situ geology and surface water intake on the site and in accordance with the recommendations in Managing Urban Stormwater Soils and Construction Volume 2E Mines and quarries (DECC 2008).

Additional criteria to be considered at stage 3 of quarry development would also include those outlined in the Strategic Framework for Mine Closure, including the objectives and principles which are:

- Stakeholder involvement,
- Planning,
- Financial provision
- Implementation,
- Standards and
- Relinquishment

It is expected that the quarry would remain a closed void after closure. Rehabilitation and closure activities would be focused on achieving a stable landform and ensuring safety to people and fauna while minimising environmental impacts including on water resources.

3.8. Equipment

A range of plant and equipment is required to construct and operate the Project. **Table 4** lists the expected equipment and plant required though this may be modified depending on the Contractor preference, equipment availability and selection based on other factors to meet the needs of the Project. All equipment would be diesel powered.

Table 4 Equipment and Plant

Item	Type / details	Quantity
Quarry Operation		
Dozer	D9	1
Mobile Crusher 1	Jaw	1
Mobile Crusher 2	Cone	1
Mobile Screen	2 Deck	1
Excavator	30t	1
Loader	972	1
Offroad trucks	30t Dump Trucks	2
Road Trucks	truck and dog or semi	3
Watercart	12kL capacity	1
Diesel Generator	1	1
Drill Rig	1	1
Construction (haul road)		
30t Excavator		1
3 x 30t Dump Trucks		3
Padfoot		1
Smoothdrum		1
Dozer		1
Truck and Dogs		3
Grader		1
Watercart		1

3.9. Haul Road

The Project includes construction of an internal haul road approximately 2.5 km long that would connect the quarry to the Golden Highway. The haul road would traverse Lots 2, 4 and 3 in DP 1160936 and Lot 1 in DP 1178562 and be contained within the relocated Right of Carriageway that is in place for this purpose (refer Section 3.14). **Photographs 6-10** and **Photograph 18** shows parts of the landscape within which the haul road would be located.

The haul road would be unsealed except for approximately 50m nearest the Golden Highway that would be sealed to reduce noise, dust and sediment tracking issues. **Photographs 11-12** show the Golden Highway near the proposed intersection.

RHM Consulting Engineers has prepared a set of design plans for the haul road showing typical plan, long-section and cross-section details, which is contained in Appendix J. The plans describe the following key details for the haul road:

- Two lane road with a single lane of travel in either direction;
- Pavement crowned for drainage to either side of road;
- Lane width of 2.75m;
- Shoulder width of 0.5m;
- Cut and fill batters at 1(V):2.5(H) batter slope;
- Maximum road gradient of 10.25%;

- Table drains on high side of road for collection of catchment runoff;
- Piped culverts located where required for transverse drainage;
- 4 x 2100 x 1800 reinforced concrete box culverts to creek crossing at Lynch's Gully, with stone pitching at inlet and outlet for scour protection;

It is intended that the road would be constructed using material extracted from the proposed Dolwendee quarry, supplemented if necessary with imported materials.

Dust control measures would be employed on the unsealed haul road as necessary to minimise fugitive dust emissions. Options include watering (with water cart), use of spray on soil tackifiers (eg Petrotac) and sealing key sections of the road, such as the entrance.

3.10. Transport

Product would be transported to market via the internal haul road, thence to the west or east via the Golden Highway. Haul trucks are expected to include truck/trailer combinations and b-doubles, which carry some 33 and 39 tonnes each respectively. Based on an extraction rate of up to 250,000 tonnes per annum, and some 270 days operation per year, the proposed quarry would generate up to some 25 to 30 laden vehicles per day. It is likely that approximately 90% of movements would be eastbound along the Golden Highway. Over a 10 hour working day, this is equivalent to some two to three trucks per hour (four to six movements two-way).

A traffic assessment has been undertaken by Colston Budd Hunt & Kafes (refer Section 6.16) and found that the traffic generated from the proposal would not have a noticeable effect on the surrounding road network. Turning volumes at the intersection of Golden Highway with the quarry access road would be less than the existing turning volumes at the Golden Highway/Rosemount Road intersection. The proposed access intersection would operate with a good level of service. There are good sight lines along the Golden Highway in both directions at the location of the proposed quarry access road. Traffic from the proposed development is therefore not expected to result in any unusual safety issues at the intersection. A standard rural intersection is proposed where the haul road meets the Golden Highway.

Consultation with RMS would occur over the intersection design and any necessary approvals from RMS such as a Works Authorisation Deed (WAD) sought.

3.11. Hours/Days of Operation

The proposed hours of operation are:

- 7am to 6pm Monday to Friday;
- 8am to 1pm Saturday; and
- No work on Sundays or public holidays.

Work on Saturdays is optional and would occur subject to demand.

The Project is expected to operate approximately 270 days per year.

3.12. Facilities and Employees

The quarry would be operated by between 3 and 5 people, including a Site Manager, equipment operators and administration/sales staff. There may be 8-10 people employed during construction.

Staffing amenities and facilities to be provided include:

- Administration/office building;
- Workshop
- Lunchroom;
- Amenities, toilets, showers;

- Car parking spaces; and
- Caretaker/Manager residence.

3.13. Services

Potable water for drinking and washing would be supplied by water tanker or bottled water. Roof water tanks may be installed to collect non-potable water for reuse around the administration area, for example for garden watering, equipment washing etc.

Non-potable water would be used in the quarry principally for dust suppression and would be sourced from stormwater runoff collected locally in the pit in sediment basins, in the first instance, with a backup supply available from the existing licensed 30ML dam at the adjoining Hollydeen property. There exists a registered easement for water supply to Lot 2 that would entitle the applicants to convey water from the dam to the quarry subject to meeting obligations under the license.

Sewerage would be managed onsite in an appropriate onsite sewage management system with onsite effluent disposal. This is expected to take the form of a small domestic septic tank system and would require only a small effluent management area due to the low volume of effluent expected from the small workforce. Design of the onsite effluent management system would be undertaken following project approval. Operational approval for the onsite sewage management system would be sought under Section 68 of the Local Government Act 1993.

Options for power supply are still being considered though are likely to include diesel generator for supply of power-intensive equipment such as crushing and screening plant. A renewable energy source such as solar would be considered for powering the amenities and administration buildings. It is not planned to run mains power to the site. Quarry equipment would be diesel powered for the most part.

3.14. Property Adjustments and Restrictions

There are a number of property easements, restrictions as to user and right of carriageways affecting the proposed development site. Some property adjustments are likely to be required to enable the proposed development to be carried out.

A survey plan prepared by Boardman Peasley is contained in **Appendix I** which describes the easements and restrictions that benefit and encumber the development site. The following property features are noted:

- Restriction on the Use of Land (RTU) exists over parts of Lot 2, Lot 3 and Lot 4. These restrictions were nominated at time of subdivision and encompass land of high environmental value such as rocky ridgelines, native vegetation and waterways. The proposed quarry remains clear of the RTU areas. No property adjustments are required in this regard;
- Lots 3 and 4 contain a Right of Carriageway (marked (C) on survey plan) 20m wide and variable width that was established for the purpose of a future haul road for the quarry and to give access to lots at the rear of the property (ie Lots 1 and 2). Through the course of EIS investigations an alternative improved alignment for the haul road has been identified. It is proposed to relocate the east-west section of the haul road crossing Lots 3 and 4 marginally to the south. This has the benefit of reducing the need for vegetation clearing while also taking advantage of existing drainage measures in the form of a contour bank that will reduce the upslope stormwater drainage catchment and minimise drainage requirements and risks for this section of the haul road. It is proposed to adjust the Right of Carriageway location accordingly.
- Easement for water supply (marked (D) on survey plan) crosses Lot 2 and benefits Lot 1 to the northwest. This easement was established with a future view to providing water supply to

Lot 1 from the existing licensed water resources. This easement would need to be relocated as it crosses the proposed quarry footprint on Lot 2. It is likely that the easement would be relocated to along the western boundary of Lot 2.

- Right of carriageway (marked (S) on survey plan) crosses Lot 2 and benefits Lot 1 to the northwest. This right of carriageway was established with a view to enabling access to Lot 1. This right of carriageway would need to be relocated as it crosses the proposed quarry footprint on Lot 2. It is proposed to relocate this access along the western boundary of Lot 2.

The abovementioned adjustments should be relatively straightforward as this adjustment can be done by the Proponent who owns all the property.

3.15. Need for the Development

The proposed Dolwendee Quarry seeks to maximise the economic and productive use of the land which contains a viable geological resource with limited alternative uses. The agricultural capability of the land is low and historical use of the land has been limited to low intensity sheep and cattle grazing.

The number of construction and mining projects currently under way or in planning has led to demand outstripping supply for the type of extractive products to be produced at the quarry. Such projects include the proposed Golden Highway Upgrade and upgrade to local roads, various coal mine expansions, agribusiness proposals and local residential subdivisions, all of which are close to the proposed quarry.

The proposed quarry will result in generation of employment and demand for products and services, and would contribute to economic activity in the local area. It would provide a source of aggregates not currently available in the local area, reducing the need to transport materials long distances by road into the subject area.

There are few alternate uses for the land where the proposed Project is to be established. The grazing qualities of this area are limited at best and the rugged nature of the terrain allows for limited alternate uses. The soils of the proposed gravel extraction area are relatively infertile solodic soils. The agronomists report (**Appendix D**) confirms that no prime agricultural land would be affected. The Project is sufficiently distant from important equine and viticultural lands so as to pose no appreciable risk to these important local agricultural industries. Furthermore, the appreciable buffer distances (exceeding 1.5 km) that exist between the proposed quarry and offsite residential receivers, plus the screening effects of topography and vegetation, support an overall assessment that the proposed quarry would not pose unacceptable impacts to the neighbouring community.

4. Statutory Planning Framework

This chapter outlines the statutory framework that applies to the proposed Project. It provides an overview of the applicable environmental planning approval process under NSW and Commonwealth legislation and details of other NSW legislation relevant to the proposed modification.

The Environmental Planning and Assessment Act 1979 (EP&A Act) and the Environmental Planning and Assessment Regulation 2000 (the EP&A Reg) provide the framework for assessment and approval of development in NSW.

Under the provisions of Part 4, Section 89C of the EP&A Act the proposed Project is SSD if a State environmental planning policy declares the development to be SSD. The proposed Project is declared by State Environmental Planning Policy (State and Regional Development) 2011 to be SSD.

Section 89D of the EP&A Act states that the Minister is the consent authority for SSD. However, the Minister may delegate the consent authority function to the Planning Assessment Commission (PAC), the Director-General or to any other public authority.

4.1. Approval Process

The proposed Project meets the criteria listed within Schedule 1, Clause 7 of the SEPP State and Regional Development and is therefore declared to be State Significant Development in accordance with Section 89C of the EP&A Act.

Schedule 1, Section 7 of SRD SEPP prescribes the following conditions for the classification of 'extractive industries' as SSD:

(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.*

The proposed Project is an extractive industry that is to extract from a resource (the subject of the development application) of more than 5 million tonnes, so meets the criteria for SSD.

The process for seeking approval for the proposal under Section 89C of the EP&A Act is outlined below:

- In order to obtain confirmation on the appropriate approval pathway, UHH submitted a Project Application to DP&E supported by a Preliminary Environmental Assessment (PEA). The PEA outlined the proposal and identified key environmental issues;
- The Secretary of the Department of Planning and Environment issued UHH with the Secretary's environmental assessment requirements (SEARs). The SEARs have been addressed as part of the detailed EIS for the proposal (this document);
- UHH prepares the EIS (this document) and lodges it with the DP&E. The Department of Planning and Environment assesses the adequacy of the EIS prior to its public exhibition;
- The EIS is publicly exhibited for at least 30 days. During this time, submissions are invited from the public and the Secretary of the Department of Planning and Environment consults with relevant public agencies regarding the issues raised (if any). In consultation with relevant agencies, the Secretary of the Department of Planning and Environment produces a preliminary set of recommendations, including measures to mitigate and manage potential environmental impacts.

- The Secretary of the Department of Planning and Environment provides UHH with draft recommendations and any public submissions received. UHH responds to any issues raised and (if required) modifies the proposal. UHH would produce a Submissions Report outlining responses to issues raised by the public, for review by the Secretary of the Department of Planning and Environment.
- If any significant modification to the proposal is made at this stage, a Preferred Project Report is prepared to clearly define the revised proposal, commitments and environmental impacts. That report will be publicly exhibited for a period of no less than 30 days for community information only (no submissions would be accepted during this period).
- DP&E evaluates the EIS, any Submissions Report and Preferred Project Report (if necessary), giving consideration to submissions received during the exhibition period. DP&E issues a draft Assessment Report and provides it to the Secretary of the Department of Planning and Environment. The Secretary consults with relevant agencies prior to finalising the Assessment Report and approving or refusing the proposal, or referring the project to the Planning Assessment Commission for approval if deemed appropriate and in accordance with the guidelines. If approved, the Conditions of Approval and the Statement of Commitments are finalised and provided to UHH with conformation of approval.

4.2. Commonwealth Legislation

4.2.1. Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of the Environment (DoE) and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as matters of 'national environmental significance' (MNES). An action that "*has, will have or is likely to have a significant impact on a matter of National Environmental Significance*" (MNES) may not be undertaken without prior approval from the Commonwealth Minister, as provided under Part 9 of the EPBC Act.

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- Great Barrier Reef Marine Park (sections 24B and 24C)
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E).

The purpose of a referral is to obtain a decision on whether the proposed action will need formal assessment and approval under the EPBC Act. An assessment of whether the proposed Project may have a significant impact on any matters of NES or on the environment of Commonwealth land was undertaken during the EIS investigations and preparation.

The Project was referred to the Commonwealth Minister for the Environment in March 2015. The referral included an assessment of significance in accordance with the EPBC Act Significant Impact Guidelines 1.1 for all MNES occurring or considered to have the potential to occur in the Project Area.

It was considered that the Project was unlikely to significantly impact any MNES. Based on the assessment submitted and the supporting documentation, the Minister for the Environment concluded that the Project is considered “not a controlled action”.

A summary of the EPBC application relevant to the various MNES follows.

World Heritage Properties

The proposed Project is not a World Heritage Property and is not in close proximity to any such area. On this basis, the Project will not impact upon any World Heritage Property either directly or indirectly.

National Heritage Places

The proposed Project is not a National Heritage Place and is not in close proximity to any such area. On this basis, the Project will not impact upon any National Heritage Place either directly or indirectly.

Wetlands of International Significance (declared RAMSAR Wetlands)

Wybong Creek, a tributary of the Goulburn River and thence the Hunter River, occurs approximately 750 metres west of the Project Area. The Project will result in a negligible reduction in the amount of run-off that flows into Wybong Creek and all water extraction for on-site works will come from existing water licences or exempted uses. Potentially contaminated stormwater runoff from disturbed parts of the quarry would be contained and managed to prevent water pollution.

Considering the large distance between the Project Area and the Hunter Estuary Wetlands; the anticipated negligible reduction of run-off into Wybong Creek; the low likelihood of water pollution and the modified nature of the Hunter Estuary Wetlands, it is expected that there will be no measureable effect on the flow regime or water quality of freshwater inflows into the Hunter Estuary Wetlands Ramsar site.

Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park does not occur within or near to the proposed Project Area. On this basis, the Project will not impact upon any areas of the Great Barrier Reef Marine Park.

Commonwealth Marine Areas

The proposed Project is not a Commonwealth Marine Area and is not in close proximity to any such area. On this basis, the Project will not impact upon any Commonwealth Marine Area.

Listed Threatened Ecological Communities

No EPBC listed TECs were recorded, or are considered to have potential to occur, within the Project Area. There is no potential for impact on TECs listed under the EPBC Act as a result of the proposed action.

Nationally Listed Threatened Species

A total of 28 threatened species listed under the EPBC Act have been recorded or have suitable habitat within a 10 kilometre radius of the proposed Project. 14 of these threatened species were fauna species and 14 flora species.

A total of 8 threatened species listed under the EPBC Act have been recorded or have suitable habitat within the proposed Project Area. Six of these threatened species were fauna species and two flora species.

The potential for the Project to significantly impact on individuals or local populations has been assessed by Umwelt (2015) via an Assessment of Significance and it was concluded that significant impacts are unlikely to occur on nationally threatened species.

Nationally Listed Migratory Species

A total of 11 migratory marine species, seven migratory terrestrial species and four migratory wetlands species listed under the EPBC Act have been recorded or have potential suitable habitat within a 10 kilometre radius of the proposed Project. One migratory species, out of the total 11 migratory species, was recorded or has the potential to occur within the proposed Project Area.

The Project is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

Summary Statement

The proposed Project will represent a relatively small cumulative impact on potential habitat and is unlikely to have a significant impact on any threatened or migratory species.

Based on the above information, an EPCB referral application was submitted to the Commonwealth Department of the Environment. On the 24 March 2014, the Minister subsequently notified that the proposed Project is not a controlled action and as such it does not require further assessment and approval under the EPBC Act before it can proceed.

4.2.2. Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derives from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, an Indigenous Land Use Agreement (ILUA) or future act agreements.

An ILUA is an agreement between a native title group and other parties who use or manage the land and waters. The ILUA process allows for negotiation between indigenous groups and other parties over the use and management of land and water resources, and the ability to establish a formal agreement. An ILUA is binding once it has been registered on the Native Title Tribunal's Register of Indigenous Land Use Agreements.

McCardle Cultural Heritage Pty Ltd (MCH) was engaged to undertake an Aboriginal Heritage Impact Assessment. MCH consulted the National Native Title Tribunal to determine the Native Title Claims registered on their register.

On the 16 December 2014, the Native Title Tribunal confirmed that the following claims had been granted or registered for consideration within the broad Muswellbrook LGA:

- Schedule of Applications (unregistered claimant applications) NC2013/006; and
- Register of Native Title Claims NC2011/006.

The Project occurs on a rural property known as "Dolwendee" comprising Lots 1, 2, 3 and 4 in DP 1160936 and Lot 1 in DP 1178562. As these lots are under a freehold title, Native Title does not apply under the Native Title Act 1993.

4.2.3. National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) provides a single national framework for the reporting and dissemination of information about the greenhouse gas (GHG) emissions, greenhouse gas projects, and energy use and production of corporations. It makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

UHH is committed to report emissions from the proposed Project on an annual basis, in accordance with the NGER Act. A preliminary GHG emissions and energy assessment has been presented in Section 6.18.

4.3. NSW State Legislation

4.3.1. Environmental Planning and Assessment Act 1979

Overview

The EP&A Act is the principal piece of legislation covering assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. The development assessment and approval system in NSW is set out in Parts 4 and 5 of the EP&A Act. As noted in Section 4.1, the Project is classified as SSD pursuant to the SRD SEPP and development consent is being sought under Part 4 of the EP&A Act.

Objects of the EP&A Act

The objects of the EP&A Act generally seek to promote management and conservation of natural and artificial resources, while also permitting appropriate development to occur. The principles of ecologically sustainable development and public participation are also objects of the EP&A Act. The consistency of the Project with these objects is summarised in **Table 5**.

Table 5 Objectives of the EP&A Act

Objective	Comments	Project Consistent with Objective?
Encourage, the proper management, development and conservation of natural and artificial resources,	The proposed Project seeks to extract and process sandstone and conglomerate to produce a range of crushed products such as road base and construction fill material to meet local demand for these construction materials. Potential environmental impacts have been assessed and mitigation measures proposed in this EIS. The assessment indicates that the proposed development, with implementation of the intended environmental management and mitigation measures, can be undertaken without having a significant impact on the environment and provide for an ecologically sustainable development.	YES
Encourage, the promotion and co-ordination of the orderly and economic use and development of land,	The orderly and economic use of land is best served by development which is permissible under the relevant planning regime and predominantly in accordance with the prevailing planning controls. The Project comprises a permissible development which is consistent with the statutory and strategic planning controls. As detailed in this EIS, the proposal will result in positive economic impacts, with appropriate mitigation measures and management strategies being proposed to reduce adverse environmental impacts.	YES
Encourage, the protection, provision and co-ordination of communication and utility services,	Options for power supply are still being considered though are likely to include diesel generator for electricity supply, and possibly a renewable energy source (such as solar). It is not planned to run mains power to the site. Quarry equipment would be diesel powered for the most part. A fixed telephone line is not anticipated. Telecommunications would be via mobile phone network and satellite and/or wireless internet. Communication and utility services can be readily provided to achieve Projects needs	YES
Encourage, the provision of land for public purposes,	This objective is not applicable to the proposed Project as no public land is located within the Project Area. No public Land is predicted to be affected by the proposed Project.	YES

Encourage, the provision and co-ordination of community services and facilities,	The proposed Project will not adversely affect community services and facilities. Where new facilities are required to be constructed, the proposed Project could provide construction materials for these works.	YES
Encourage, the protection of the environment,	Specialist consultants have been engaged to assess and report on the potential for the Project to impact upon the local environment. Notably, the impacts on flora and fauna have been addressed within Section 6.2 .	YES
Encourage, ecologically sustainable development (ESD),	The proposal is consistent with the principles of ecological sustainable development as outlined in Section 8.3 .	YES
Encourage, the provision and maintenance of affordable housing,	This objective is not applicable to the proposed Project.	YES
To provide increased opportunity for public involvement and participation in environmental planning and assessment.	As outlined in Section 5 , UHH has engaged with the community as part of the environmental assessment process. Public exhibition and the development assessment process provide further opportunity for public participation in the consideration of the proposed Project.	YES

The Secretary of the Department of Planning and Environment has provided the assessment requirements for the EIS, as discussed in **Section 1.4**.

Assessment Requirements

Due to the fact that the proposed Project is classified as SSD, it is subject to the general assessment requirements under part 4 of the EP&A Act as amended under Part 4, Division 4.1 of that Act. These requirements are further discussed in this section.

Matters of Consideration (Section 79C)

Section 79C of the EP&A Act identifies for the consent authority to take into consideration when determining a development application. A summary of these matters together with an indication of where they have been addressed in this report is presented in **Table 6**.

Table 6 Section 70C Matters for Consideration

Matters for Consideration	Relevant EIS Section
The provisions of: <ul style="list-style-type: none"> Any environmental planning instrument. 	Refer to Sections 4.3 and 4.5
<ul style="list-style-type: none"> Any proposed that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Director-General has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved). 	No proposed instruments have been identified as being relevant to the Project.
<ul style="list-style-type: none"> Any development control plan. 	As specified in Clause 11 of the SRD SEPP, no development control plans are relevant as the Project is classified as SSD under the EP&A Act (refer to Section 4.1 and 4.5.1).
<ul style="list-style-type: none"> Any planning agreement that has been entered into under Section 93F, or any draft planning agreement that a developer has offered to enter into under section 97F. 	No planning agreements have been entered into under s93F.
<ul style="list-style-type: none"> The regulations (to the extent that they prescribe matters for the purposes of this paragraph). 	Refer to Section 4.3 .

<ul style="list-style-type: none"> Any coastal zone management plan (within the meaning of the Coastal Protection Act 1979) that applies to the land to which the development application relates. 	No coastal management plans apply to the land.
<ul style="list-style-type: none"> The likely impacts of the development, including environmental impacts, on both the natural and built environments, and social and economic impacts in the locality. 	Refer to Section 6 .
The suitability of the site for the development.	Refer to Sections 6 .
Any submissions made in accordance with this Act or the regulations.	Comments to be received on the EIS during the exhibition period.
The public interest.	Refer to Section 6.15 and Section 8 .

Permissibility

The local environmental planning instrument that is relevant to the project is the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP 2009). As previously detailed, the Project Area is zoned RU1 Primary Production (RU1 zone) under the Muswellbrook LEP 2009. Extractive industry is permitted with consent within the RU1 zone.

Authorisations Which Do Not Apply

In line with Section 89J of the EP&A Act, if a SDD is granted development consent under Part 4 of the EP&A Act, the authorisations listed in **Table 7**, which may otherwise be relevant, will not be required to carry out the Project.

Table 7 Authorisations Which Do Not Apply

Relevant Legislation	Approvals Not Required
<i>(a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of that Act,</i>	Carrying out works within the coastal zone.
<i>(b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994,</i>	Permit for works or structures within a waterway. The Project would not involve dredging or reclamation works, would not result in harm to marine vegetation and would not block fish passage. However, some disturbance of a minor watercourse (Lynch's Gully) may be required during construction of the haul road and installation of culverts.
<i>(c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,</i>	Disturbance to an item listed on State Heritage Register or Interim Heritage Order; Excavation Permit.
<i>(d) an Aboriginal heritage impact permit under section 90 of the National Parks and Wildlife Act 1974,</i>	An Aboriginal heritage impact permit (AHIP) under s90 and Division 8 of Part 6.
<i>(e) an authorisation referred to in section 12 of the Native Vegetation Act 2003 (or under any Act repealed by that Act) to clear native vegetation or State protected land,</i>	Consent for clearing of native vegetation.
<i>(f) a bush fire safety authority under section 100B of the Rural Fires Act 1997,</i>	A bushfire safety authority under s100B

(g) a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the Water Management Act 2000.	A water use approval under s89, a water management work approval under s90 or an activity approval (other than an aquifer interference approval) under section 9.
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Nevertheless, the DP&E will likely consider the relevant matters associated with these authorisations during the assessment and determination of the Project.

Legislation to be Applied Consistently

If a State Significant Development is granted development consent under Part 4 of the EP&A Act, the authorisation listed in **Table 8**.

Table 8 Approvals and legislation to be applied consistently with Development Consent

Act	Approval	Authority
Protection of the Environment Operations Act 1997.	An Environmental Protection Licence (EPL).	Environment Protection Authority (EPA)

Development Contributions

Section 94 of the EP&A Act enables the consent authority to impose a condition requiring the applicant to provide a development contribution of the consent authority “... *is satisfied that development for which development consent is sought will or is likely to require the provision of or increase the demand for public amenities and public services within the area*”.

Section 93F of the EP&A Act enables the applicant to enter into a VPA with planning authorities (such as local government). Under VPA, the proponent commits to providing a contribution that is to be applied towards a public purpose. Provided that the Minister is party to an agreement, a VPA can exclude the application of Section 94 of the EP&A Act. Section 93 F allows for the proponent’s contribution to be facilitated through a VPA rather than as a condition of development consent.

4.4. Summary of Other Key NSW State Legislation

In addition to the requirements for development consent under Part 4 of the EP&A Act and an EPL, the proposed Project will potentially require approvals, licenses and/or authorities under various other pieces of NSW State legislation. **Table 9** lists the key relevant pieces of NSW State legislation and indicates the implications, if any, to the Project.

Table 9 Summary of Other State Legislation

Act	Comments	Specific Approval Required for Project
<i>Protection of the Environment Operations Act 1997</i>	<p>The <i>Protection of the Environment Operations Act 1997</i> (POEO Act) is administered by the Environmental Protection Authority and provides for a system of environmental protection licences for scheduled development work and activities, as well as the ability to issue environmental protection notices for pollution and waste management. Environmental offences are also described under the POEO Act.</p> <p>Schedule 1 of the POEO Act identifies types of development known as scheduled activities that require an environment protection licence. Clause 19 of Schedule 1 relates to “Extractive activities”. The Project meets the definition of a scheduled activity under Clause 19 as it is a land based extraction activity that would involve the extraction of more than 30,000 tonnes per year of extractive material.</p> <p>An Environmental Protection Licence (EPL) is to be obtained for the proposed Project.</p>	EPL
<i>Water Act 1912</i>	<p>This Act has been repealed by the Water Management Act 2000; however, some of licencing provisions remain in force where the water source is not covered by a water sharing plan. The proposed Project does not require licencing or approvals under the Water Act 1912.</p>	
<i>Water Management Act 2000</i>	<p>The objectives of the Water Management Act 2000 (WM Act) are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The provisions of the WM Act are being progressively implemented in NSW, repealing various other pieces of legislation in the process.</p> <p>The Project is within the area covered by the Water Sharing Plan for the Wybong Creek Water Source, prepared in accordance with the provisions of the WM Act.. The Water Sharing Plan covers the waters of the Wybong Creek Water Source including all water occurring on the land surface, including any lakes and wetlands in this water source, along with the groundwater within the alluvial sediments associated with the rivers in this water source whilst excluding any groundwater contained in fractured rock aquifers for which licencing still remains under the Water Act 1912.</p> <p>The WM Act describes, under Sections 89, 90 and 91, a range of approvals including water use approvals, water management work approvals and activity approvals. The provisions of Sections 89 and 90 are in force only within water sharing areas. Given the site is within a water sharing plan area these provisions must be considered. Controlled activity approvals under Section 91 of the WM Act now apply in all areas of the state.</p> <p>Section 89J of the EP&A Act declares that a water use approval under s89, a water management work approval under s90 or an activity approval (other than an aquifer interference approval) under section 91 are not required for a SSD project granted development consent under Part 4 of the EP&A Act. As such these authorisations do not apply.</p> <p>Section 91 provides that aquifer interference activities require an aquifer interference approval. As indicated in Section 0, a Groundwater baseline monitoring has been undertaken by RCA Pty Ltd (RCA) as part of the EIS. RCA identified that an aquifer interference approval or groundwater licence is NOT required.</p>	

<p><i>Threatened Species Conservation Act 1995</i></p>	<p>The TSC Act provides for the protection for threatened plants and animals native to NSW and integrates the conservation of threatened species into development control processes under the EP&A Act.</p> <p>Umwelt (2015) conducted seven-part tests under the TSC Act for the two threatened flora species and six threatened fauna species recorded or suspected to occur within the Project Area (see Section 6.2). Umwelt concluded that significant impacts are unlikely to occur on nationally threatened species.</p>	
<p><i>Roads Act 1993</i></p>	<p>Section 138 of the <i>Roads Act 1993</i> requires that consent be obtained prior to disturbing or undertaking work in, on or over a public road. The Project proposes the construction of a haul road and a new standard rural intersection off the Golden Highway to access the Project Area.</p> <p>Pursuant to Clause 89K of the EP&A Act, consent under Section 138 of the <i>Roads Act 1993</i> cannot be refused if it is necessary for carrying out an approved SSD proposal.</p> <p>Consultation with RMS would also occur over the intersection design and any additional approvals required from RMS such as a Works Authorisation Deed (WAD).</p>	<p>WAD</p>
<p><i>Crown Lands Act 1989</i></p>	<p>The Crown Lands Act 1989 provides for the administration and management of Crown Land in the eastern and central divisions of NSW. Crown land may not be occupied, used, sold, leased, dedicated, reserved or otherwise dealt with unless authorised by this Act or the Crown Land (Continued Tenures) Act 1989. The Minister may grant a “relevant interest” such as a lease, licence of permit, over Crown Land for the purposes of any infrastructure, activity or other purpose that the Minister thinks fit.</p> <p>There is no Crown land within the area proposed for the Dolwende quarry and access road. On this basis, the Project should not require a licence to use Crown Land under the provisions of the <i>Crown Lands Act 1989</i>.</p>	
<p><i>Dams Safety Act 1978</i></p>	<p>This Act requires that the NSW Dams Safety Committee (DSC) periodically review large dams that may constitute a hazard to human life and property. These dams are known as prescribed dams and are listed in Schedule 1 of the <i>Dams Safety Act 1978</i>.</p> <p>The proposed Project does not propose the construction of any new dams and as such no approval is required under this Act.</p>	
<p><i>Environmental Hazardous Chemicals Act 1895 (EHC Act)</i></p>	<p>Under the EHC Act a licence is required for any storage, transport or use of prescribed chemicals.</p> <p>UHH does not propose to store, transport or use any chemicals currently subject to a Chemical Control Order (CCO) under this Act. If such chemicals are required during the life of the Project, UHH will manage the chemicals in accordance with the relevant CCO, including obtaining any appropriate licences.</p>	

4.5. State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) are Environmental Planning Instruments (EPs) prepared by the Minister to address issues significant to NSW. The SEPPs outlined in the below sub-sections are relevant considerations for the proposed Project.

4.5.1. SEPP (State and Regional Development) 2011

SEPP (State and Regional Development) 2011 (SRD SEPP) came into effect upon the repeal of Part 3A of the EP&A Act. The air of the SEPP is to identify development that is State significant development. The SEPP also identifies development that is State significant infrastructure and critical

State significant infrastructure. Schedule 1, Section 7 of SRD SEPP prescribes the following conditions for the classification of ‘extractive industries’ as SSD:

(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.*

The proposed Project is development that is included in Schedule 1 of the SRD SEPP as it is an extractive industry that is to extract from a resource (the subject of the development application) of more than 5 million tonnes.

As discussed in Section 4, the proposed Project is a SSD and, as such, Division 4.1 and Part 4 of the EP&A Act applies to the approval pathway for the Project (see **Section 4.1**).

4.5.2. SEPP (Mining, Petroleum Production and Extractive Industries) 2007

SEPP (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of NSW. The SEPP also states that extractive industries are permissible with development consent on land for which development for the purposes of agriculture or industry may be carried out (with or without development consent).

As discussed in Section 4.3.1, extractive industries are permissible with consent within the Project Area under the Muswellbrook LEP. The Project therefore does not need to rely on the permissibility provisions of the Extractive Industries SEPP.

Part 3 of this SEPP, specifically Clauses 12 to 17 (inclusive), requires consideration to be given to the compatibility of projects with other surrounding land uses, natural resource management, environmental management and rehabilitation. The information presented in this EIS addresses each of these matters, and the assessment undertaken has been multi-disciplinary and involved consultation with various government agencies and stakeholders. Emphasis has been placed on anticipation and prevention of potential environmental and social impacts, with various mitigation measures, management strategies, and monitoring activities proposed to minimise adverse impacts. **Table 10** summarises key relevant provisions from the SEPP.

Table 10 Summary of Relevant Mining SEPP Provisions

Relevant Section (and issue)	Comment
Section 12AB	
Cumulative Noise	Cumulative noise impacts have been considered. The predicted contribution of quarry noise to the surrounding catchment is expected to remain below 35dBA and satisfy the INPs daytime amenity criteria of 50dBA, LAeq(period) for rural receivers (see Section 6.4.3.5)
Cumulative Air Quality	Air quality modelling has been undertaken and includes cumulative impacts. Modelling considers existing background dust levels along with predicted dispersion modeling results (see Table 22), and predicts that cumulative average annual PM2.5 and PM10 would remain below 30 µg/m3 of PM 10 for residential receivers (see Section 6.3.5)
Airblast Overpressure	The assessment found that the criteria for blast induced ground vibration and air overpressure are readily achievable and that impacts due to blasting should be negligible (see Section 6.5.3 and Appendix H - Blasting Assessment)
Ground Vibration	The estimated ground vibration at the closest residence some 1.5km from the quarry is well below the likely lower environmental licence limit of 5mm/sec PPV (see Section 6.5.3 and Section 4 of Appendix H - Blasting Assessment).
Aquifer Interference	Baseline groundwater level monitoring has been undertaken on-site. It is considered highly unlikely that quarrying to the top of the Greigs Creek Coal Seam will penetrate the groundwater surface at the site. Excavation of the quarry is expected not to intersect the coal seam aquifer or groundwater at the site (see Section 6.8.5 and Appendix N - Groundwater Assessment). The PProposal is not expected to result in aquifer interference

Section 12	
Compatability	The agricultural assessment (Appendix D) identified the Project area as having a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district. The Project is not predicted to have any appreciable adverse impact on, and is considered compatible with, the local equine and viticultural industries (see Section 2.4 and Section 6.10).
	The agricultural assessment (Appendix D) identified the Project area as having a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district. In comparison, quarry operations would generate more than 5 million tonnes of construction materials that would assist in local mining and construction projects and contribute to economic development in the Upper Hunter and beyond (see Section 6.10 and Section 6.15.3).
	The Project is considered compatible with surrounding and existing land uses. A complaints handling procedure would be established to assist in managing potential conflict with the local community during quarry operations (see Section 6.10 and Section 6.15.4)
Section 12A	
Voluntary Land Acquisition	There is no land acquisition being considered as part of the Project.
Section 13	
Compatability with existing mine, petroleum production facility or extractive industry	The Project is adjacent to the Glencore-operated Mangoola Coal Mine site to the north and east (see Section 2.4.2).
Compatability with existing and approved uses	The agricultural assessment (Appendix D) identified the Project area as having a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district. The Project is adjacent to the Glencore-operated Mangoola Coal Mine site to the north and east. The Project is considered compatible with surrounding and existing land uses. (see Section 2.4, Section 6.15.3 and Section 8.2).
Section 14	
Natural resource management	Surface water, water balance and groundwater impacts have been assessed and mitigation measures developed to ensure that the development is undertaken in a responsible manner (see Sections 6.6, 6.7 and 6.8, respectively). Biodiversity has been assessed and mitigation measures developed to avoid or minimise biodiversity impacts (see Section 6.2 and Appendix K). Greenhouse gas emissions have been assessed and mitigation measures developed to ensure impacts are minimised (see Section 6.18).
Greenhouse gas	Greenhouse gas emissions have been assessed and mitigation measures developed to ensure impacts are minimised (see Section 6.18).
Biodiversity	Biodiversity has been assessed and mitigation measures developed to avoid or minimise biodiversity impacts (see Section 6.2 and Appendix K).
Section 15	
Resource recovery	Waste, recycling and reuse management has been assessed and mitigation measures developed to mitigate potential impacts (see Section 6.17). A materials estimate, extraction rate and quarry life have been assessed and quarry staging developed to ensure the recovery of materials is optimised and efficient (see Section 3.3 to Section 3.7). The proposed staging does not prevent or inhibit opportunities for future expansion or extension of resource extraction should this be desirable.
Section 16	
Transport	Traffic and truck movements have been assessed and mitigation measures developed to avoid or minimise traffic impacts to public roads. Consultation with RMS would occur regarding the design of the intersection of the proposed haul road and the Golden Highway, including any additional approvals required from RMS such as a Works Authorisation Deed (WAD) (see Section 6.16 and Appendix P).
Referral	This application will require referral to the RMS
Section 17	
Rehabilitation	A Rehabilitation Strategy would be prepared for the site to promote an integrated approach to quarry management, rehabilitation and closure in line with the key principles in the Strategic Framework for Mine Closure in order to address potential environmental and safety impacts (See Section 6.19).

4.5.3. SEPP No. 44 – Koala Habitat Protection

SEPP No. 44 – Koala Habitat Protection provides for the protection of koala habitat by ensuring that areas subject to development proposals are considered for their value as habitat or potential habitat

for koalas. The Muswellbrook LGA is listed under Schedule 1 of SEPP No. 44 as an area to which the SEPP applies.

The *Flora and Fauna Assessment* (Umwelt 2015) in **Appendix K** addresses the proposed Project in relation to SEPP No. 44. Several Koala feed tree species listed under SEPP No. 44 were detected within the proposed Project. Umwelt (2015) concluded that the Project Area does provide areas of 'Potential Koala Habitat' as defined in SEPP No. 44, however, as there were no observations of Koalas during field surveys, it does not provide 'Core Koala Habitat'.

4.5.4. SEPP No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) requires the consent authority to consider whether an industrial proposal is a potentially hazardous or offensive industry that without the implementation of appropriate impact minimisation measures would, or potentially would, pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment.

Hazardous industry is limited to industrial developments which after all measures proposed to reduce or minimise its impact have been employed, the industry would still pose a significant risk to the surrounding populace and/or biophysical environment.

The Project should not pose any significant risk to the surrounding populace, properties or environment with the implementation of best management practices for hydrocarbons and explosives used within the Project Area, as well as effective implementation of the approved EMS and occupation health and safety management systems. Section 6.14 addresses hazards in relation to the Project.

In determining whether an industrial development proposal has the potential to be offensive, the level of offence is not considered significant if the relevant authority is willing to issue a licence under its environment and/or pollution control legislation. In this case, if the EPA considers that the conditions of the Project's EPL, issued under the provisions of the POEO Act, can be met, then the proposal is highly unlikely to be offensive.

4.6. Hunter Regional Environmental Plan 1989 (Heritage)

The *Hunter Regional Environmental Plan 1989 (Heritage)*, which is now a deemed SEPP, applies to the Muswellbrook LGA. The general aim of this plan is to conserve the environmental heritage of the Hunter Region, including the historic, scientific, cultural, social, archaeological, architectural, natural and aesthetic heritage.

There are no heritage items or conservation areas within the Project Application Area listed in the Schedules of this deemed SEPP.

4.7. Muswellbrook Local Environmental Plan

Local Environmental Plans (LEPs) are EPIs that guide planning decisions for LGAs and allow Councils to manage the ways in which land is used through zoning and development consents.

The Project is predominantly located on land zoned as RU1 (Primary Production) under the Muswellbrook LEP.

The land use table in the Muswellbrook LEP provides that extractive industries are permissible with consent within zone RU1.

The objectives of the zone include:

"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 the zone and land uses within adjoining zones;
To protect the agricultural potential of rural land not identified for alternative land use, and to minimise the cost to the community of providing, extending and maintaining public amenities and services;
To maintain the rural landscape character of the land in the long term;
To ensure that development for the purpose of extractive industries, underground mines (other than surface works associated with underground mines) or open cut mines (other than open cut mines from the surface of the floodplain), will not:

- *Destroy or impair the agricultural production potential of the land or, in the case of underground mining, unreasonably restrict or otherwise affect any other development on the surface, or*
- *Detrimentially affect in any way the quantity, flow and quality of water in either subterranean or surface water systems, or*
- *Visually intrude into its surroundings, except by way of suitable screening.*

To protect or conserve (or both):

- Soil stability by controlling development in accordance with land capability, and
- Trees and other vegetation, and
- Water resources, water quality and wetland areas, and their catchments and buffer areas, and
- Valuable deposits of minerals and extractive materials by restricting development that would compromise the efficient extraction of those deposits.”

The information presented in this EIS addresses the relevant matters of the Muswellbrook LEP and should enable meaningful consideration of the proposal by MSC. The assessment undertaken has been multi-disciplinary and involved consultation with various government agencies, including MSC, and stakeholders. Emphasis has been placed on anticipation and prevention of potential environmental and social impacts, with various mitigation measures, management strategies, and monitoring activities proposed to minimise adverse impacts.

4.8. Other Considerations

4.8.1. Upper Hunter Strategic Regional Land Use Plan

In March 2012, the NSW government placed the *Draft Upper Hunter Strategic Regional Land Use Plan* (draft SRLUP) (DP&I, 2012a) on public exhibition. The document established a preliminary “Gateway process” for a scientific assessment of the impacts of a state significant mining and coal seam gas projects on Strategic Agricultural Land (SAL). In September 2012, the *Upper Hunter Strategic Regional Land Use Plan* (SRLUP) (DP&I, 2012b) was finalised and released. The document provides a Gateway process for all State significant mining and coal seam gas developments, which involves the verification of SAL, and if it exists, an assessment by an independent panel of experts (referred to as the “Gateway Panel”) against the criteria of the SRLUP.

The SRLUP and associated gateway process are not relevant to this Project which is not either mining or coal seam gas development. Nonetheless, the EIS does identify areas of SAL within the vicinity of the Project and considers the potential impacts of the Project on SAL.

There are two categories of SAL:

- Biophysical Strategic Agricultural Land (BSAL); and
- Critical Industry Cluster land (CIC), which is represented by the Equine and Viticulture CIC.

The proposed Project is on land shown on Map 6 Strategic Regional Land Use Plan, Upper Hunter under the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive*

Industries) 2007 as Strategic Agricultural Land (SAL) comprising Critical Industry Clusters (CICs) equine and viticulture.

A description of the current land uses, agricultural production, identification of BSAL and the CIC Viticulture and Equine within the Project area is presented in Sections 2.2 and 6.10. The project is not anticipated to have any impact on SAL.

4.8.2. Mine Health and Safety

In relation to the health & safety of mining and quarrying operations, operations would comply with the following Acts & Regulations

- Work Health & Safety Act 2011
- Work Health & Safety Regulations 2011
- Mine Health & Safety Act 2004
- Mine Health & Safety Regulations 2007
- Explosives Act 2003 and the Explosives Regulations 2005

Drinking water from an independent water supply (i.e. not town water) would follow the NSW Private Water Supply guidelines (2014). The Public Health Act 2010 and the Public Health Regulation 2012 require drinking water suppliers, including private water suppliers, to develop and adhere to a 'quality assurance program' (or drinking water management system) from 1 September 2014.

5. Consultation and Issues Identification

This section outlines the consultation undertaken in respect to the proposed Project, and includes a summary of the community, stakeholder, agency and Aboriginal consultation that has been undertaken to date.

5.1. Community Consultation

The focus of community consultation has been to identify the key community stakeholders, consult with these identified stakeholders to provide them with details of the proposed Project, and give stakeholders an opportunity to provide feedback and identify any issues of concern so that these may be considered in the EIS.

5.1.1. Community Stakeholder Identification

The key community stakeholders were selected by investigation of the community within the immediate area of the Project. Although the Project is in a relatively isolated rural location surrounded by large landholdings, a small number of residential receivers and businesses are expected to have an interest in the Project.

Recent aerial imagery and viewpoint analysis (both from and to the proposed quarry) was used to help identify the key residential receivers for consultation, which were selected based on several key factors:

- proximity to the proposed quarry and haul road (generally within an arc of between 2km and 5km surrounding the proposed quarry);
- potential for views of the Project;
- potential to be impacted by aspects such as noise, dust vibration and traffic.

This analysis resulted in 22 key residential receivers being identified (refer **Figure 3**). These are detailed in **Table 11**.

Receivers R1 to R8 inclusive and R10 have been acquired by Glencore Mangoola Coal. Receivers 15 and 16 are owned by the Proponent and a related party and are supportive of the Project.

5.1.2. Consultation Activities and Feedback

Consultation with the key residential receivers was undertaken in October 2015. An Information Flyer with accompanying letter was prepared and distributed in person (preferably), or by mail if the land owner/occupier could not be contacted.

The Proponents undertook to meet with all the surrounding neighbours over two days between 7th and 8th October 2015. In some cases where contact details could be found the neighbours had been contacted in advance to arrange a meeting time.

A summary of the consultation activities undertaken and feedback obtained is provided in **Table 12**. A number of neighbours indicated they were supportive of the Project or had no particular interest in the Project. A number residents expressed concerns about the potential environmental and safety impacts of the Project. Key concerns identified by the community were potential for impacts from noise, dust and blasting, and concerns over the safety at the proposed haul road intersection with the Golden Highway.

Table 11 Receiver Identification

Receiver No.	Address	Land Owner / Organisation Name	View to quarry from residence?	Distance to Quarry (km)	Distance to Haul Rd entrance (km)
R1	Lot 501/DP521971, 2581 Wybong Road, Wybong	Glencore Mangoola Coal	No views to quarry or haul road	2.4	> 2.5
R2	Lot 156/DP750968, 2577 Wybong Road, Wybong	Glencore Mangoola Coal	No views to quarry or haul road	3.2	> 2.5
R3	Lot 194/DP750968, 2575 Wybong Road, Wybong	Glencore Mangoola Coal	No views to quarry or haul road	3.9	> 2.5
R4	Lot 97/DP750968, 2581 Wybong Road, Wybong	Glencore Mangoola Coal	Possible distant view to quarry	3.4	> 2.5
R5	Lot 9/DP750968, 2589 Wybong Road, Wybong	Glencore Mangoola Coal	Possible distant view to quarry	3.5	> 2.5
R6	Lot 18/DP750969, 853 Yarraman Road, Wybong	Glencore Mangoola Coal	No views to quarry or haul road	4.6	> 2.5
R7	Lot 6/DP750969, 2739 Wybong Road, Wybong	Glencore Mangoola Coal	Yes - distant views to quarry hillside	3.3	> 2.5
R8	Lot 1/DP845915, LOT 79 Wybong Road, Wybong	Glencore Mangoola Coal	Yes - distant views to quarry hillside	2.7	> 2.5
R9	Lot 901/DP812768, 3000 Wybong Road, Wybong	Beverley Doris Swan	No views to quarry or haul road	2.7	> 2.5
R10	Lot 91/DP750969, LOT 91 Wybong Road, Wybong	Glencore Mangoola Coal	Yes - views to quarry hillside	2.0	> 2.5
R11	Lot 11/DP1084150, 3220 Wybong Road, Hollydeen	Lee Boland and Rebecca Brookfield	No views to quarry or haul road	2.9	> 2.5
R12	Lot 102/DP1118411, LOT 102 Reedy Creek Road, Hollydeen	Cathal O'Leary	No views to quarry. Screened by trees along Reedy Creek and topography	2.3	> 2.5
R13	Lot 101/DP1118411, 120 Reedy Creek Road, Hollydeen	Bradley Robert Collins and Amanda Jane Collins	Glimpses of quarry (if any). Trees along Reedy Creek would help screen.	3.4	> 2.5
R14	Lot 103/DP1118411, 120 Reedy Creek Road, Hollydeen	Colin and Linda Seagrave	No views to quarry. Screened by trees along Reedy Creek and topography	2.3	> 2.5
R15	Lot 6/DP1160936, 1010 Golden Highway, Hollydeen	United Pastoral (Proponent)	N/A	1.3	> 2.5
R16	Lot 3/DP1160936, 770 Golden Highway, Hollydeen	Upper Hunter Holdings (Proponent)	N/A	1.2	> 2.5
R17	Lot 56/DP1034185, 863 Golden Highway Hollydeen "Golden Grove Horse Stud"	L Thomson PT Pty Ltd, Lease to Ultra Thoroughbred Racing Pty Ltd	No view of quarry. Possible view of haul road	1.7	1.4
R18	Lot 4/DP837808, 770 Golden Highway, Hollydeen	Kevin and Joyce Warby	No view of quarry. Possible glimpses of haul road	1.6	0.5
R19	Lot 101/DP872448, 39 Rosemount Road, Hollydeen "Carellan Holiday Cottages"	Steven Carter	No view of quarry. Possible glimpses of haul road	1.8	0.5

Receiver No.	Address	Land Owner / Organisation Name	View to quarry from residence?	Distance to Quarry (km)	Distance to Haul Rd entrance (km)
R20	Lot 108/DP750924, 711 Merriwa Road, Denman	Timothy Joseph Castle	No view of quarry. Possible glimpses of haul road	1.6	0.2
R21	Lot 107/DP750924, 687 Merriwa Road, Denman	Gordon and Julie Cooper 65472197	No views to quarry or haul road	2.1	0.7
R22	Lot 2/DP587737, 652 Merriwa Road, Denman	Thomas Laing 65472691	No views to quarry or haul road	2.0	0.8

Table 12 Community Consultation Activities and Outcomes

Person/Organisation Consulted	Date	Description
Thomas Laing	7-Oct-15	- Michael and Russell (Proponent) met Thomas at his house, handed him the Information flyer and letter, and briefly described the project. Initial discussions were cordial but deteriorated when discussing the location of the haul road being along the closed road now owned by the Proponent. Thomas became angry and asked the Proponent to leave. (Side note: Thomas may be confusing the haul road location with another easement on his property)
	12-Oct-15	- KMH received Feedback Form completed by Thomas Laing who listed a number of concerns: noise, dust, environment and traffic. Thomas believes the proposed location of haul road intersection on Golden Highway is dangerous.
Beverly Swan	7-Oct-15	- Flyer and letter left in letter box as requested by her.
Lee Boland	7-Oct-15	- Michael and Russell (Proponent) met Lee at his home gave him the letter and the flyer. Lee was very supportive. He has trucks and is interested in possible contract work with the quarry..
Linda Seagrave	7-Oct-15	- Michael and Russell (Proponent) met Linda at her home (Russell had spoken to on the telephone the day before). Linda was given the letter and the flyer and together they reviewed the map on the flyer. Together the parties stood out the front of Linda's house on the corner of the Golden Highway and Reedy Creek Road where it was observed that the proposed quarry is not visible from her property. Linda had no questions or apparent concerns.
Kevin Warby	7-Oct-15	- Michael and Russell (Proponent) met Kevin Warby who was driving one of his trotters around his training track which is in the front north eastern corner of his property fronting the Golden highway and Rosemount Road. A description was given of the proposed quarry and Kevin was given the letter and flyer. Discussions were cordial and Kevin's only concern was any dust being generated by the quarry on top of the dust he already gets from Mangoola. - Kevin said words to the effect of "I will not object but if I have a problem I will come to you and expect you to work with me." This was agreed.
	13-Oct-15	- KMH received Feedback Form completed by Kevin Warby. Kevin expressed concerns over the proposed entry point being dangerous. Concern was also raised regarding noise and dust due to potential property devaluation; and blasting due to potential damage to his home and alarm it may cause his horses.
Gordon Cooper	7-Oct-15	- Michael and Russell (Proponent) met Gordon who works for Patrick Wild who runs a competitor quarry near Muswellbrook. Gordon expressed opposition over the project as he is employed by Patrick Wild who owns a quarry at Muswellbrook.

Person/Organisation Consulted	Date	Description
Steven and Narrelle Carter	7-Oct-15	<ul style="list-style-type: none"> - Michael and Russell (Proponent) met Steven and Narrelle at their home. Steven indicated they wouldn't object but expressed concerns over the intersection of Rosemount Rd and the Golden Highway particularly B Doubles turning left into Rosemount Rd which have to cross onto the wrong side of the Golden Highway. He referred to a recent traffic accident when a car went under the trailer of a B Double making such turn. - Narrelle asked about operating hours and if they include weekend work – they need quiet for their guests. Proponent indicated it would only be Saturday morning and subject to demand.
	21-Oct-15	<ul style="list-style-type: none"> - KMH received Feedback Form completed by Steven Carter who listed a number of concerns: noise, dust and traffic interaction. Steven indicated he had noticed noise and dust emissions which he believed came from the proposed quarry site previously (possibly when the exploration drilling was being undertaken). Steven believes the proposed haul road intersection is a dangerous location.
Tim Castle	8-Oct-15	<ul style="list-style-type: none"> - Russell (Proponent) met with Tim Castle who indicated his full support for the proposed quarry.
Cathal and Rebecca O'Leary	8-Oct-15	<ul style="list-style-type: none"> - Russell and Gary (Proponent) met with Cathal O' Leary and his wife Rebecca and gave them the letter and flyer. Cathal enquired about the material strength and properties of the quarry resource. Cathal did not raise any concerns and was very supportive of the proposal.
Amir Khan (Manager Golden Grove)	8-Oct-15	<ul style="list-style-type: none"> - Russell and Gary (Proponent) met with Amir to leave the letter and flyer and discuss the proposal. Amir did not indicate any concerns over the proposal. Amir indicated he is supportive of local projects
Glencore Mangoola Coal	9-Oct-15	<ul style="list-style-type: none"> - Gary (Proponent) phoned Ben Clibborn (Mangoola Coal Environmental Manager) and discussed the Quarry application. Ben was aware of this. Gary indicated that Russell (Proponent) had also spoken to Nigel Charnock (Glencore Property General Manager) and was emailing the Flyer. Gary agreed to email same to Ben - Information flyer and letter emailed to Ben Clibborn and Nigel Charnock
Brad Collins	14-Oct-15	<ul style="list-style-type: none"> - Gary Williams (Proponent) met with Brad Collins at his property on Wednesday 14th October and subsequently at Dolwendee on Thursday 15th October. Information flyer and letter given to Brad. Gary provided Brad with a full inspection of the Quarry Development site including haul road location and quarry site. Attempt was made to identify location/s which would be visual from his property. The only location was on the western side of the quarry site where through trees we could glimpse his workshop. Brad's house was not visible. - Brad left site satisfied and Gary invited Brad to contact directly if any further queries

5.2. Aboriginal Community Consultation

McCardle Cultural Heritage (MCH), commenced consultation with the local Aboriginal community in relation to the proposed Project. As outlined in the below sub-sections, the consultation was undertaken in compliance with the four stage process required under the former Department of Environment, Climate Change and Water's (DECCW, now part of OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) (ACHCR). The *Heritage Impact Assessment* (RPS 2013) contained in **Appendix O** provides further detailed information in relation to the Aboriginal consultation process.

5.2.1. Stage 1 – Notification of Project and Registration of Interest

Formal consultation processes for the Project commenced on the 8 December 2014 with the distribution of letters to the following parties seeking the identification of Aboriginal parties that may have an interest in the Project:

- Office of Environment and Heritage (OEH);
- Wanaruah LALC;
- Muswellbrook City Council;
- Registrar Aboriginal Land Rights Act 1983;
- National Native Title Tribunal;
- Native Title Services Corporation Limited; and
- Catchment Authority;

Each Aboriginal party identified through this process was contacted by letter (22 December 2014) inviting a registration of interest for the Project consultation process. In addition, an advertisement was placed in the Hunter Valley News (17 December 2014) seeking expressions of interest from Aboriginal parties. The Aboriginal parties identified through the ACHCR process and those parties that registered an interest in participating in the consultation process has been listed in **Table 54**.

5.2.2. Stage 2 – Presentation of Project Information

In this stage the registered Aboriginal parties were provided with information regarding the scope of the proposed project and the cultural heritage assessment process. An information packet was provided to them and included:

- An outline of the project details including the nature, scope and methodology of the proposed survey, maps and a description of likely impacts;
- An outline of the impact assessment process;
- An outline of critical timelines and milestones for the completion of the assessment and delivery of reports;
- Methods of investigation including archaeological and cultural;
- Clearly defined roles, functions and responsibilities of the OEH, proponent, the registered Aboriginal parties and the LALC;
- A number of forms were included that the registered stakeholders may use, or provide their own form of information required (Aboriginal stakeholder site officer application, register of knowledge holder, cultural significance and comments on proposed methodology);
- A written response to the survey methods and the preferred method of sharing traditional knowledge methods was due no later than 2 February 2015.

5.2.3. Stage 3 – Gathering Information on Cultural Significance

The aim of this stage was to facilitate a process whereby the registered Aboriginal stakeholders could:

- Contribute to culturally appropriate information gathering and the research methodology;
- Provide information that would enable the cultural significance of any Aboriginal objects and or/places within the proposed Project area to be determined; and
- Have input into the development of any cultural heritage management options and mitigation measures.

In order to achieve the above, the information pack sent for Stage 2 included the following information pertaining to the gathering of cultural knowledge:

- MCH and UHH extended an invitation to develop and implement appropriate protocols for sourcing and holding cultural information including any restrictions to place on information, as well as the preferred method of providing information;
- Request for traditional/cultural knowledge or information associated with ceremonial, spiritual, mythological beliefs, traditions and known sites from the pre-contact period;
- Request for traditional/cultural knowledge or information regarding sites or places with historical associations and/or cultural significance which date from the post-contact period and that are remembered by people today (e.g. plant and animal resource use areas, known camp sites); and
- Request for traditional/cultural knowledge or information in relation to any sites or places of contemporary cultural significance (apart from the above) which has acquired significance recently.

The registered Aboriginal stakeholders did not disclose any specific traditional/cultural knowledge or information of sites or places:

- Associated with spiritual, mythological, ceremonies or beliefs from the pre-contact period within the study area or surrounding area; or
- Any information pertaining to sites or places of cultural significance associated with the historic or contemporary periods within the study area or surrounding area.

5.2.4. Survey

All groups were invited to participate in the survey on 17/2/15. The investigation area was surveyed by representatives from the registered Aboriginal stakeholders including John and Margaret Matthews (ANTEC) and Allen Paget (UAC) and the archaeologist in accordance with the proposed methodology provided to the stakeholders for review and approved.

During the survey, the Aboriginal representatives were also asked of their traditional knowledge and of any areas of cultural significance within the study area and if they felt comfortable in sharing that information. Discussions centred on places associated with ceremonial, spiritual, mythological beliefs, traditions and known sites that date from the pre-contact period. Sites or places with historical associations and/or significance which date from the post-contact period and that are remembered by people today (e.g. plant and animal resource use areas, known camp sites) were discussed as well as sites or places of contemporary significance (apart from the above) which has acquired significance recently.

The registered Aboriginal stakeholders did not disclose any specific traditional/cultural knowledge or information of sites or places:

- Associated with spiritual, mythological, ceremonies or beliefs from the pre-contact period within the study area or surrounding area; or

- Any information pertaining to sites or places of cultural significance associated with the historic or contemporary periods within the study area or surrounding area.

5.2.5. Stage 4 – Review of Draft Heritage Impact Assessment

The draft *Aboriginal Heritage Impact Assessment* prepared for the project was forwarded to the registered Aboriginal parties in March 2015 for review and comment. The responses received from the parties are appended to the final *Aboriginal Heritage Impact Assessment* (MCH 2015) contained in **Appendix O**.

All submissions from the registered Aboriginal parties were responded to, the draft report altered to include their comments, and all parties were provided a copy of the final report.

5.3. Agency Consultation

Consultation with Government Agencies was initiated by the Department of Planning and Environment (DP&E) during compilation of the Site Environmental Assessment requirements (SEARs). Agencies that provided a response to DP&E for inclusion in the SEARs included:

- NSW Office of Environment and heritage (OEH)
- NSW Department of Primary Industries (DPI) – Office of Water
- Muswellbrook Shire Council (MSC)
- NSW Heritage Council
- NSW Local Land Services (LLS)
- NSW Health
- NSW RMS
- NSW Trade & Investment
- NSW Environment Protection Authority

Consultation was undertaken with a number of Agencies during EIS development where necessary to seek support for proposed investigation methodologies, clarify the Agencies' requirements for the EIS or discuss external approval requirements. A summary of this consultation is provided in **Table 13**.

No additional or new matters were raised for assessment in the EIS.

Table 13 Summary of stakeholder and agency consultation undertaken to date

Agency / Date	Person/s Consulted	Description	Outcomes / Follow-up
NSW Department of Planning and Environment (DP&E)			
5-May-2014	N/A	Online Application for SSD with Preliminary Environmental Assessment. Request for DGRs.	SEARs received
6-Feb-15	Howard Reed	Phone: KMH contacted DP&E to obtain details of relevant planning officer	Email: DP&E advised planning Officer is Thomas Watt
27-Feb-2015	Thomas Watt	Email: KMH contacted DP&E to provide an update on the cultural heritage assessment and to seek clarification of future process in relation to an Aboriginal Cultural Heritage Management Plan (ACHMP), and approvals for collection and reburial of Aboriginal objects	Email: DP&E outlined their expectations for ACHMP and subsequent approvals
14-Apr-2015	Thomas Watt	Email: KMH notified DP&E of project change – addition of blasting. Requested updated SEARs (as required)	
22-Apr-2015	Thomas Watt	Email: DP&E provided updated SEARs	
21-May-15	Thomas Watt	Email: KMH notified DP&E of issues raised by Tocomwall in relation to the Aboriginal Heritage assessment, and provided copy of response to same	
Commonwealth Department of the Environment (DotE)			
30-Jan-15	Mahani Taylor, Natasha Amerasinghe, Paula Banks	Teleconference: Proponent and consultants (KMH and Umwelt) met with DotE Officers to discuss the biodiversity survey and assessment, and status of proposed listing under EPBC Act of Central Hunter Valley Eucalypt Forest and Woodland Complex vegetation community.	
13-Feb-2015	EPBC Referrals Gateway / Cathy Crozier	Email from DotE acknowledging receipt of EPBC Referral Ref 2015_7433	
25-3-15	Martin Henery	Email to proponent advising that the referral is deemed "Not a Controlled Action". Letter notice followed.	
NSW Office of Environment and Heritage (OEH) – Biodiversity Conservation			
30 May 2014	Richard Bath	Letter to DP&E containing OEH input to DGRs	

Agency / Date	Person/s Consulted	Description	Outcomes / Follow-up
14-Jan-15	Robert Gibson Richard Bath	Meeting: Proponent and consultants (KMH and Umwelt) met with OEH Officers to discuss biodiversity assessment findings and planned approach to offset package. OEH advised that since issuing the DGRs the Framework for Biodiversity Assessment (FBA) became the NSW-government endorsed environmental assessment process. The project is a 'transitional project' under the FBA which means OEH has some discretion in how strictly the FBA is followed. Proponent. Umwelt offered to use the FBA calculator as a tool for justifying the offset.	Email: OEH notified DP&E and proponent confirming that the full use of the FBA does not need to be followed for this project; but sufficient data should be provided by proponent to justify the proposed offset (eg using FBA calculator)
NSW Office of Environment and Heritage (OEH) – Heritage Division			
30 May 2014	Richard Bath	Letter to DP&E containing OEH input to DGRs	
12 – 16 February 2015	Nicole Davis	Several phone calls and emails were exchanged between KMH, OEH and McCardle Cultural Heritage (MCH) regarding claims by Tocomwall of improper consultation. This communication is outlined in detail in the Annex A of the Aboriginal Heritage Impact Assessment (Appendix O)	OEH advised that the consultation process followed by MCH is in accordance with the guidelines and complies with OEH requirements.
NSW Department of Primary Industries (DPI) – Office of Water			
June 2014	Kristian Holz	Letter to DP&E containing NOW input to DGRs	
11-Dec-14	Rohan Macdonald	KMH emailed a range of background information relating to the Project with a focus on groundwater issues, ahead of planned face to face meeting	
15-Dec-14	Rohan Macdonald and John Williams	Meeting: Proponent and consultants (KMH and RCA) met with DPI Officers to discuss findings of initial groundwater investigation and proposed further baseline monitoring and groundwater assessment. DPI accepted on the basis of information provided that the proposed quarry appears unlikely to intercept groundwater and is relatively low risk. DPI do wish to see information on water balance, water licensing, maximum harvestable rights capacity, and proposed monitoring program. DPI accept it seems unnecessary to undertake detailed groundwater modelling.	
10-Aug-15	Rohan Macdonald	KMH emailed Rohan to provide an update. Later found out that Rohan is on leave and Kerry Lee is the relevant officer to contact.	
12-Aug-15	Kerry Lee	KMH phoned Kerry and sent a follow up email summarising the groundwater investigations and findings, and seeking to clarify NOW's requirements for the groundwater investigations and reporting in light of these findings.	
19-Aug-15	Kerry Lee	DPI emailed KMH confirming the interpretations about groundwater levels and potential impact seem valid. DPI suggest three monitoring wells be maintained so that flow directions and elevation contours can be determined. DPI advised that the EIS should address the SEARs and justify why any particular items are not being addressed if that is the case	

Agency / Date	Person/s Consulted	Description	Outcomes / Follow-up
27-Aug-15	Kerry lee	KMH emailed DPI with questions relating to harvestable rights and licensing	No response received
Muswellbrook Shire Council (MSC)			
27 May 2014	Craig Fleming	Letter to DP&E containing MSC input to DGRs	
8-Oct-2015	Eddie Lovett, Donna	Meeting: Proponent met with MSC to discuss the proposed development. MSC was given a copy of the Information Flyer. Council were interested in the Proponent's attendance on members of the community and the results of these discussions	MSC requested a soft copy of the Information Flyer which was subsequently sent by email on 9-Oct
NSW Heritage Council			
20 June 2014	Siobhan Lavelle	Letter to DP&E containing NSW Heritage Council's input to DGRs	No further consultation undertaken.
NSW Local Land Services (LLS)			
3 June 2014	Steve Eccles	Letter to DP&E containing LLS input to DGRs	No further consultation undertaken.
NSW Health			
30 May 2014	David Durrheim	Letter to DP&E containing NSW Health input to DGRs	No further consultation undertaken.
NSW RMS			
2 June 2014	Martin Jenkins	Email to DP&E advising that RMS have not particular requirements for inclusion in the DGRs. RMS note that the proposed traffic volumes are not excessive. RMS will assess the application during exhibition	No further consultation undertaken.
NSW Trade & Investment			
27-May-2014	Cressida Gilmore	Letter to DP&E containing NSW Trade & Investment input to DGRs	No further consultation undertaken.
NSW Environment Protection Authority			
28-May-14	Bill George	Letter to DP&E containing NSW EPA's input to DGRs	No further consultation undertaken.

6. Environmental Impact Assessment

6.1. Environmental Risks

This section introduces and describes the key environmental risks and provides a comprehensive assessment of these risks related to the Project. The key potential environmental impacts have been identified through assessment of the Project scope, review of the SEARs issued by DP&E, and consultation with relevant government agencies and neighbouring landowners.

6.1.1. Methodology

Each potential environmental impact was systematically reviewed with reference to the current scope of the proposed Project, the findings and recommendations (for management and mitigation measures) from the specialist reports and other documentation, as well as outcomes from previous stakeholder engagement.

Discussion of the existing environmental features and potential environmental impacts related to the proposed Project was undertaken.

The issues that were addressed in the environmental risk analysis were:

- Biodiversity;
- Air quality, odour and;
- Noise and vibration;
- Blasting;
- Surface water;
- Ground water;
- Soils and geology;
- Agricultural capability;
- Aboriginal heritage;
- Non-Aboriginal heritage.
- Visual amenity;
- Hazards including bushfire;
- Social and economic;
- Traffic;
- Waste;
- Greenhouse gases;
- Socioeconomic; and
- Land rehabilitation and quarry closure.

Overall, the environmental risks presented by the Project are not significant. A number of features of the Project contribute to this assessment, including:

- The relative isolation of the proposed quarry and the significant separation distances to the nearest residential and other sensitive receptors;
- Its location on low quality agricultural land that has limited alternative uses;
- The existing physical/topographical barrier to the south of the proposed quarry pit location and other topographic features which substantially limit visibility of the development from offsite lands;
- The immediate proximity of an appropriate biodiversity offset area;
- The Project's proximity to an established road network (Golden Highway); and

- The relatively small production rate and transport volumes on a daily/annual basis, resulting in low impacts to the local road network.

Where the analysis identifies potential environmental impacts, it concludes that these can be adequately managed through the incorporation of mitigation and management measures into the design or implementation of the Project during its construction, operation and closure.

6.2. Biodiversity

A detailed ecological assessment of the Project was undertaken by Umwelt (2015) to describe the flora and fauna features present within UHH lands (hereafter referred to as the wider study area) and the potential ecological impacts due to the Project. Flora and fauna surveys were undertaken in spring 2014.

The Ecological Assessment report (Umwelt, 2015) is included in **Appendix K** and provides details regarding the ecology assessment including:

- Regional context and habitat connectivity;
- Surveys methodology;
- Threatened species, threatened ecological communities (TECs), endangered populations (EPs) and migratory species identified during surveys or during the literature review;
- Assessment of the level of flora and fauna impact due to the Project;
- Proposed mitigation and monitoring measures; and
- The proposed biodiversity offset strategy.

6.2.1. Overview

Previous documents and reports relevant to the Project were reviewed to inform the field survey methodology, results and impact assessment contained in the ecology report. This included regional and sub-regional vegetation mapping reports in the vicinity of the Project and relevant ecological database searches. The information was used to inform survey design, and to assist in the assessment of potentially occurring threatened and migratory species, EPs and TECs.

Key steps involved in the vegetation survey undertaken in spring 2014 included:

- aerial photograph interpretation (API);
- field survey site selection using stratification;
- field survey and associated plant identification; and
- vegetation community description and delineation.

Appendix K contains details of flora and fauna survey methodologies, mapping delineation techniques, habitat assessments and a list of relevant guidelines.

6.2.2. Vegetation Communities and Flora

Surveys of the wider study area including and surrounding the Project Area identified eight native vegetation communities (refer to **Figure 9**).

A total of 7.4 hectares of the Narrow-leaved Ironbark - Grey Box Grassy Woodland of the Central and Upper Hunter in moderate to good condition was found within the Project area and is consistent with Central Hunter Grey Box– Ironbark Woodland Endangered Ecological Community (EEC).

A total of 142 plant species were identified during the flora surveys, 27 of which were introduced species. Two threatened flora species were recorded within the wider study area: pine donkey orchid (*Diuris tricolor*) listed as Vulnerable under the TSC Act and *Prasophyllum petilum* listed as Endangered under the TSC Act and EPBC Act.

A total of 460 pine donkey orchids were recorded within the wider study area during the surveys, with seven individuals occurring within the Project area that are likely to be impacted.

Table 14 outlines the vegetation communities and their size found within the Project area. A summary of the threatened species and populations found in the Project disturbance area is detailed in **Table 15**.

Figure 10 illustrates the locations of threatened species and endangered populations recorded.

Table 14 Vegetation communities within the Project area

Vegetation Community	EEC	Hectares within Project Area	Condition	Description
Narrow-leaved Ironbark - Grey Box Grassy Woodland of the Central and Upper Hunter – Derived Native Grassland	No	14.8	Low	A derived native grassland there was no true canopy, but with emergent trees present.
Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	Yes	7.4	Moderate to Good Condition	Is consistent with Central Hunter Grey Box–Ironbark Woodland EEC.
Cleared Land	No	< 1	NA	Areas mapped as cleared land comprise disturbed land, non-native vegetation, water bodies, dwellings and roads.

Table 15 Threatened Flora Species, Endangered Populations and Threatened Ecological Communities

Species/Population/Community Name Common name Scientific name	Recorded in Wider Study Area?	Recorded in Project Disturbance Area?	Status	
			TSC Act 1995	EPBC Act 1999
Pine donkey orchid Diuris tricolor	Yes	Yes	V	-
Tarengo leek orchid Prasophyllum petilum	Yes	No	E	E
Pine donkey orchid population in the Muswellbrook local government area	Yes	Yes	EP	-
Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	Yes	Yes	EEC	CEEC
Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion	Yes	No	VEC	CEEC
White Box – Yellow Box – Blakely’s Red Gum Woodland	Yes	No	EEC	CEEC

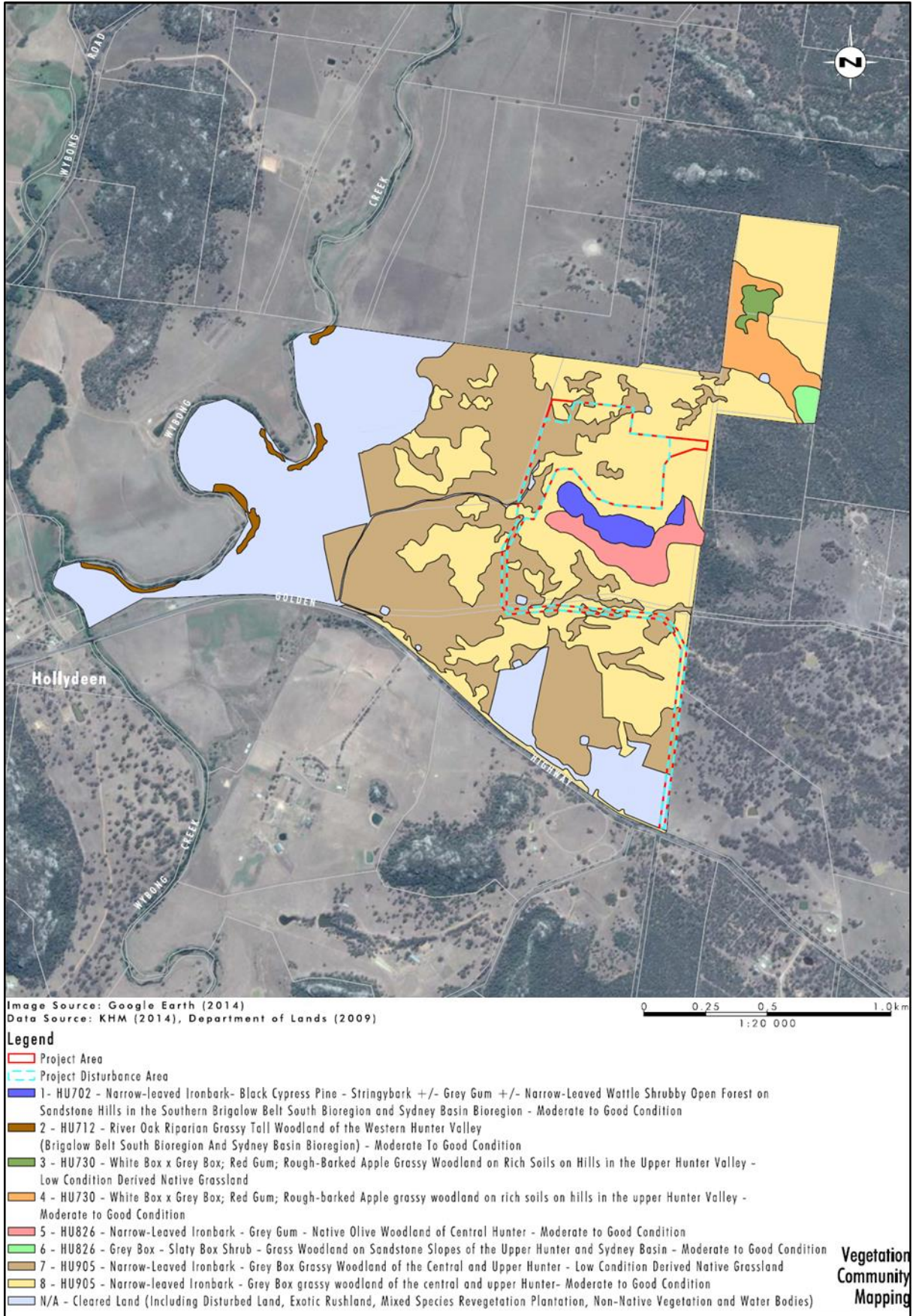


Figure 9 Vegetation Community Mapping

Source: Umwelt (2015)

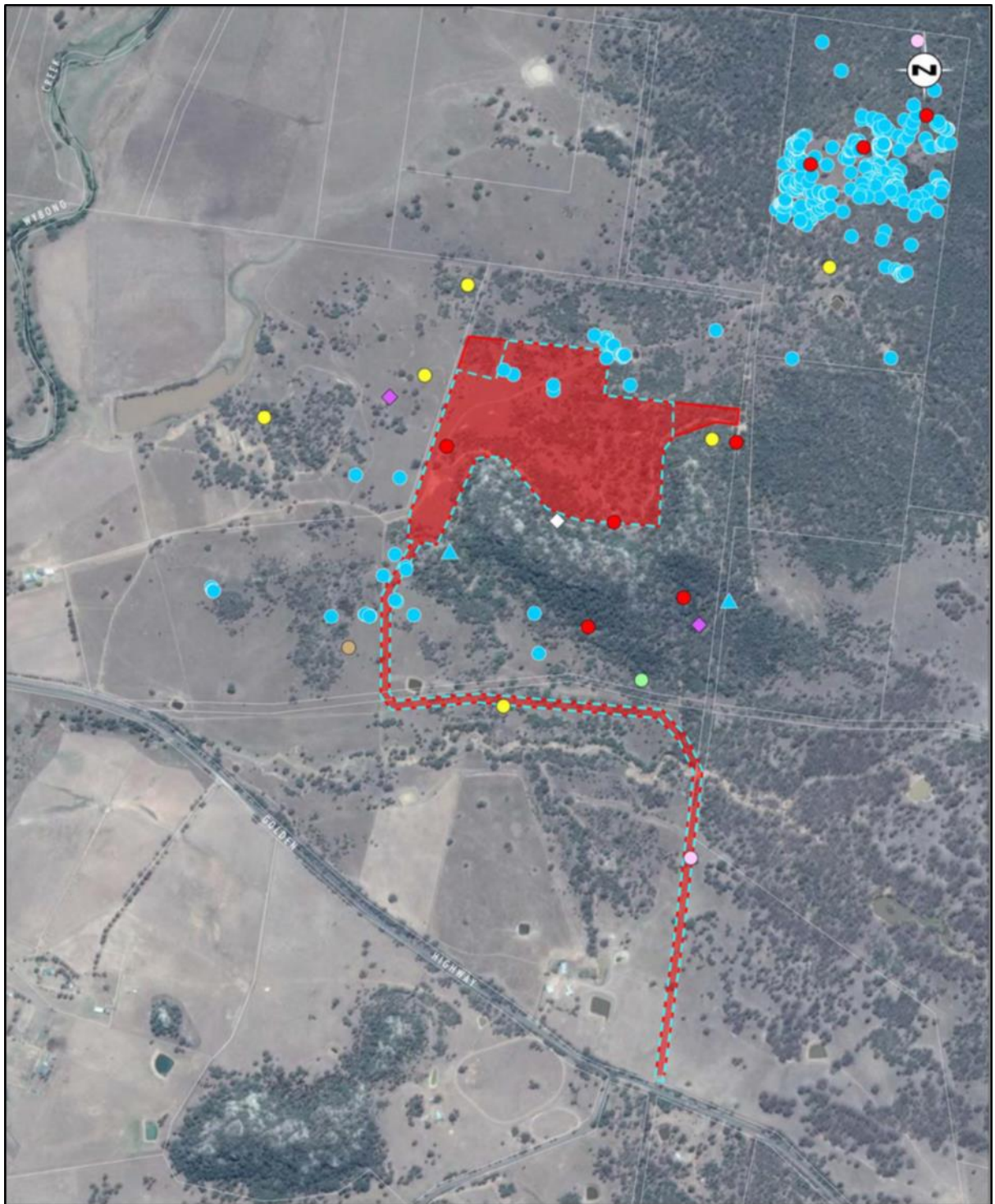


Image Source: Google Earth (2014)
 Data Source: KMH (2014), Department of Lands (2009)

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Legend

- | | | |
|---|--------------------------------|-----------------------------|
| Project Area | Large-eared pied bat | <i>Prasophyllum petilum</i> |
| Project Disturbance Area | Little bentwing-bat | |
| Brown treecreeper (eastern subspecies) | Rainbow bee-eater (migratory) | |
| Eastern bentwing-bat | Speckled warbler | |
| Glossy black-cockatoo | Yellow-bellied sheath-tail-bat | |
| Grey-crowned babbler (eastern subspecies) | <i>Diuris tricolor</i> | |

**Threatened Flora and Fauna Species,
 Endangered Populations and
 Migratory Species Records**

Source: Umwelt (2015)

Figure 10 Threatened Flora and Fauna Species, Endangered Populations and Migratory Species Records

6.2.3. Fauna

Targeted field surveys identified a total of 113 fauna species comprising 5 frog species, 8 reptiles, 76 birds and 24 mammals within the wider study area. A total of eight threatened fauna species were recorded within the wider study area. One additional threatened fauna species was recorded in the wider study area by Envirofactor in 2008 (Envirofactor 2008). The threatened species recorded are listed in **Table 16**.

No potential koala habitat as defined by SEPP 44 was recorded within the Project area. No koalas were identified during extensive walking or driving spotlight searches in the wider study area and the species has not been recorded during annual fauna monitoring surveys.

The Project Area and wider study area is not considered to provide habitat for any listed endangered fauna populations.

Table 16 Threatened fauna species recorded in the wider study area and/or Project area

Species name	Status		Recorded in Wider Study Area?	Recorded in Project Disturbance Area?
glossy black cockatoo <i>Calyptorhynchus lathami</i>	V	-	Yes	No
brown tree creeper <i>Climacteris picumnus victoriae</i>	V	-	Yes	No
speckled warbler <i>Chthonicola saggitata</i>	V	-	Yes	Yes
grey-crowned babbler <i>Pomatostomus temporalis temporalis</i>	V	-	Yes	Yes
squirrel glider <i>Petaurus norfolcensis</i>	V	-	Yes	No
yellow-bellied sheath-tail bat <i>Saccolaimus flaviventris</i>	V	-	Yes	No
large-eared pied bat <i>Chalinolobus dwyeri</i>	V	V	Yes	No
little bentwing-bat <i>Miniopterus australis</i>	V	-	Yes	No
eastern bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V	-	Yes	No

Notes: E = endangered
V = vulnerable

6.2.4. Groundwater Dependent Ecosystems and Aquatic Habitat

No aquatic habitat or GDEs were identified by surveys and desktop assessment within the Project Area. Wybong Creek was identified as the only Groundwater Dependent Ecosystem (GDE) within the vicinity of the Project.

6.2.5. Potential Impacts

Key factors in Project design have been designed to ameliorate the impacts on significant ecological features, such as threatened species, EPs, TECs and/or their habitats. The approach to this has been

to avoid ecological impact and maximise use of existing disturbed areas as much as possible. The two major considerations are detailed below:

- Quarry location – The quarry location, size and layout was determined with consideration of numerous factors, including the site geology, landscape, vegetation and hydrology. Importantly, the quarry footprint has been located away from the prominent rocky ridgeline which contains the largest area of intact native vegetation on the property and is considered to contain the most important native fauna habitat. A significant proportion of the quarry footprint is cleared land and the quarry was located to minimise, as far as practicable, further clearing of woodland vegetation. These measures aim to minimise the ecological impacts of the proposal.
- Haul Road location – The haul road location has been refined to reduce the need for further clearing of woodland vegetation and paddock trees. An example of this is the central section of the haul road that runs roughly east-west across Lots 3 and 4. An additional feature of the final haul road location is the protection afforded to it by an existing contour drain, again in the section where this crosses Lot 4 in an east-west direction. This existing contour drain will significantly reduce the potential for stormwater run-on to the haul road and as a result, minimise the need for additional drainage infrastructure (and associated vegetation clearing) and reduce the erosion and sedimentation risk both during construction and operation of the haul road.

After refining the Project to reduce ecological impacts as outlined above, there remain a number of potential residual ecological impacts which include:

- Loss of approximately 22.2 hectares of native vegetation comprising:
 - 7.4 hectares of Central Hunter Grey Box– Ironbark Woodland EEC, which is also woodland habitat for threatened woodland birds and micro-bats including known habitat for grey-crowned babbler (*Pomatostomus temporalis temporalis*) and speckled warbler (*Chthonicola sagittata*); and
 - 14.8 hectares of non-threatened derived native grassland community;
- Removal of seven (7) pine donkey orchids (*Diuris tricolor*) identified within the Project area;
- Disturbance of 22.2 hectares of known and potential habitat for the pine donkey orchid (*Diuris tricolor*);
- Weed species could be inadvertently brought into the Project area with imported materials, or could invade naturally through removal of native vegetation;
- Introduced fauna species such as foxes, rabbits, pigs, dogs and feral cats could increase within the Project Area due to increased disturbance;

Based on the ecological values of the Project Area, the Project is unlikely to result in a substantial impact on ecological values. Despite this, a Biodiversity Offset Strategy will be required to address the residual impacts of the Project. The Project will result in the removal of approximately 22.2 hectares of native vegetation, including (approximately) 7.4 hectares of Central Hunter Grey Box– Ironbark Woodland EEC and 14.8 hectares of Derived Native Grassland.

A range of indirect impacts have also been considered in the ecological impact assessment, including (but not limited to) erosion and sedimentation impacts on aquatic and terrestrial ecosystems, impacts relating to the deposition of dust, increased noise, changes to weed and vertebrate pest species abundance and distribution and the impact of bushfire. The indirect impacts of the Project were considered in the preparation of assessments of significance for threatened species and ecological communities considered to be potentially impacted by the Project.

6.2.6. Mitigation Measures

The Project is not likely to result in a substantial impact on species diversity in the wider study area as the higher quality, in-tact communities associated with the eastern escarpment areas and the lower slopes in the north will not be directly impacted as a result of the Project.

Based on the outcomes of the surface water and groundwater assessments, the Project is not expected to result in an adverse impact on the potential GDE identified in the wider study area.

The approach to the Project would be to avoid ecological impact and maximise use of existing disturbed areas as much as possible. **Table 17** summarises the mitigation and management measures that would reduce the risk of inadvertent ecological impacts due to the Project.

Table 17 Flora and Fauna Mitigation Measures

Measure No.	Mitigation measure
FF1	The quarry footprint would be located away from the prominent rocky ridgeline which contains the largest area of intact native vegetation on the property and is considered to contain the most important native fauna habitat.
FF2	A weed management strategy would be developed prior to the construction of the quarry.
FF3	An appropriate feral animal control strategy will be developed prior to the commencement of the construction of the quarry
FF4	A tree felling procedure would be implemented to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of hollow-bearing trees.
FF5	All personnel who will capture/handle/house and/or transport native fauna species (injured or uninjured) will be appropriately licensed under the requirements of the NSW Animal Ethics Committee.
FF6	Site personnel (particularly vehicle operators) will be briefed on fauna awareness issues and will be required to report incidents involving injury to native wildlife
FF7	Assistance from a wildlife carer or veterinarian will be sought if injured native wildlife are encountered.
FF8	A Biodiversity Offset Strategy would be developed to address the impacts of the Project
FF9	A Biodiversity Offset Management Plan (BOMP) for the proposed biodiversity offset area will be prepared following approval of the Project to detail the planned improvements and its ongoing management for biodiversity conservation and enhancement purposes. The BOMP will outline monitoring requirements to assess the adequacy of the impact management strategies at the site.

6.2.7. Biodiversity Offsets

A Biodiversity Offset Strategy is proposed to compensate for residual impacts on those species, vegetation communities and ecological features that are likely to be, or could potentially be, significantly impacted by the Project. The Biodiversity Offset Strategy has also been prepared in accordance with the Principles for the Use of Biodiversity Offsets in NSW, and in accordance with the Project SEARs.

Based on the ecological values of the Project Disturbance Area summarised in **Section 6.2.5**, the Project is unlikely to result in a substantial impact on ecological values. Despite this, a Biodiversity Offset Strategy will be required to address the residual impacts of the Project. The Project will result in the removal of approximately 22.2 hectares of native vegetation, including (approximately) 7.4 hectares of Central Hunter Grey Box – Ironbark Woodland EEC and 14.8 hectares of derived native grassland.

The Biodiversity Offset Strategy (BOS) has been developed to compensate for residual impacts of the Project on these species, habitats or features. The key features to be addressed are outlined in **Table 18** below.

Table 18 Significant Ecological Features Addressed in the Biodiversity Offset Strategy

Ecological Feature	Area of Impact / Number of Individuals
Central Hunter Grey Box - Ironbark Woodland EEC	7.2 hectares
Pine donkey orchid (<i>Diuris tricolor</i>)	7 individuals
Woodland habitat	7.2 hectares
Speckled warbler	5 individuals

The proposed Biodiversity Offset Area (refer to **Figure 11** and **Figure 12**) is 16 hectares in area. It is located to the north of the Project Disturbance Area in Lot 1 which is currently owned and managed by UHH. The Biodiversity Offset Area adjoins a dedicated conservation offset for the Mangoola Coal project (Umwelt 2006) to the east. A detailed assessment of the biodiversity offset strategy against the Principles for Biodiversity Offsetting (OEH, 2014) is contained in **Appendix K**.

Summary of the Ecological Values

The ecological features of the Biodiversity Offset Area include:

- 13 hectares of Central Hunter Grey Box – Ironbark Woodland EEC listed under the TSC Act
- 1.6 hectares of White Box-Yellow Box-Blakely’s Red Gum Woodland EEC listed under the TSC Act
- 1.3 hectares of derived native grassland (DNG), which is likely to have once supported White Box-Yellow Box-Blakely’s Red Gum Woodland. All of the DNG areas are likely to naturally regenerate into a functional woodland ecosystem (EEC) over time following the removal of grazing pressure
- 15 hectares of native vegetation
- 247 pine donkey orchids (*Diuris tricolor*), and 247 individuals of the Pine Donkey Orchid (*Diuris tricolor*) Endangered Population in the Muswellbrook Local Government Area, both listed under the TSC Act
- known speckled warbler habitat
- 14.63 hectares of woodland habitat and 1.33 hectares of DNG providing potential habitat for at least 13 threatened fauna species.

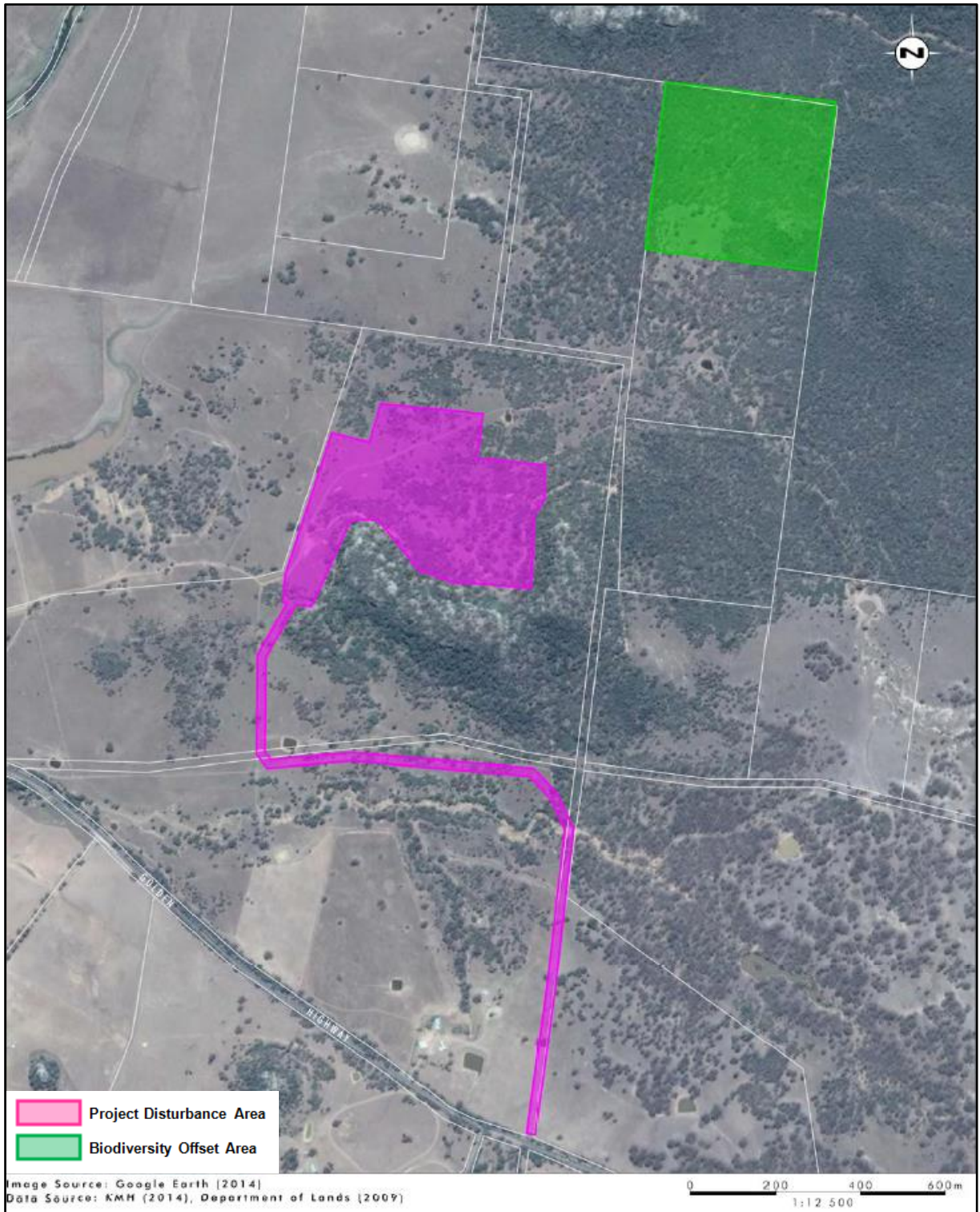
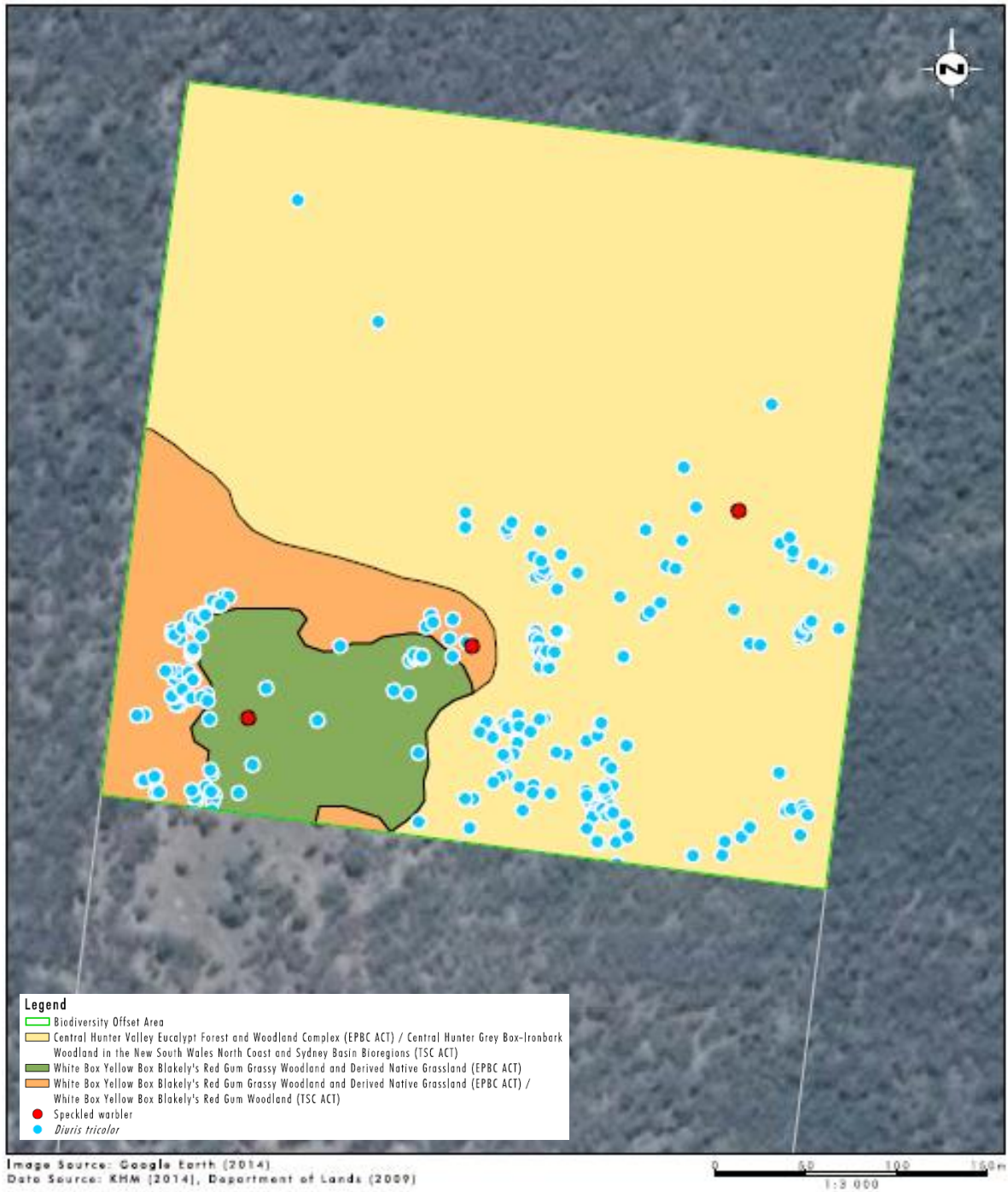


Figure 11 Project Disturbance Area and Biodiversity Offset Area

Source: Umwelt (2015)



Source: Umwelt (2015)

Figure 12 Threatened Species and TECs in Biodiversity Offset Area

6.3. Air Quality

An Air Quality Impact Assessment (AQIA) was prepared by Todoroski Air Sciences (2015) and is provided in **Appendix L**.

The AQIA was undertaken to assess the potential air quality impacts associated with the construction and operation of the Project. The scope included:

- Review of existing meteorological and air quality environment surrounding the proposal site;
- Dispersion modelling;
- Presentation of the predicted results and discussion of potential air quality impacts.

The AQIA was undertaken with consideration to the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005). A brief summary of the AQIA is provided in the following sections.

6.3.1. Potential Impacts

Construction dust emissions could be primarily generated due to material handling, vehicle movements and windblown dust generated from exposed areas. Dust emissions could be generated from the following activities:

- extraction of material;
- loading/unloading of material;
- transport/haulage of material;
- drilling and blasting;
- Processing of materials (crushing and screening of material);
- windblown dust generated from exposed areas and stockpiles; and
- exhaust emission from the operation of construction vehicles.

6.3.2. Air Quality Assessment Criteria

The air quality goals that are relevant to the Project are summarised in **Table 19** and outlined in the NSW EPA document Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW DEC, 2005).

The key contaminants considered in this assessment are:

- Total suspended particulates (TSP);
- Particulate matter less than 10 microns (PM₁₀); and
- Deposited dust.

The air quality goals for total impact relate to the total dust burden in the air and not just the dust from the proposal. Consideration of background dust levels needs to be made when using these goals to assess potential impacts.

Table 19 NSW EPA Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Impact	Criterion
TSP	Annual	Total	90µg/m ³
PM ₁₀	Annual	Total	30µg/m ³
	24 hour	Total	50µg/m ³
Deposited dust	Annual	Incremental	2g/m ² /month
		Total	4g/m ² /month

Source: NSW DEC, 2005

$\mu\text{g}/\text{m}^3$ = micrograms per cubic metre

$\text{g}/\text{m}^2/\text{month}$ = grams per square metre per month

The Commonwealth Ambient Air Quality National Environmental Protection Measures (NEPM) specifies standards and goals for air pollutants including PM_{10} and $\text{PM}_{2.5}$. The standard for PM_{10} is outlined in **Table 20**. It is noted that the NEPM permits five days annually above the 24-hour average PM_{10} criterion to allow for bush fires and similar events.

Table 20 Standard for PM_{10} Concentrations

Pollutant	Averaging Period	Maximum concentration	Maximum allowable exceedences
PM_{10}	24 hour	$50\mu\text{g}/\text{m}^3$	5 days a year

Source: NEPC, 2003

The NSW EPA currently does not have impact assessment criteria for $\text{PM}_{2.5}$ concentrations. The Ambient Air Quality NEPM applies advisory reporting standards for $\text{PM}_{2.5}$ to gather sufficient data nationally to facilitate a review. The advisory reporting standards for $\text{PM}_{2.5}$ are outlined in **Table 21**.

As with each of the NEPM goals, these apply to the average, or general exposure of a population, rather than to "hot spot" locations.

Table 21 Advisory reporting standards for $\text{PM}_{2.5}$ concentrations

Pollutant	Averaging Period	Advisory Reporting Standard
$\text{PM}_{2.5}$	24 hour	$25\mu\text{g}/\text{m}^3$
	Annual	$8\mu\text{g}/\text{m}^3$

6.3.3. Meteorological Conditions

Long-term climatic data from the Bureau of Meteorology weather station at Scone SCS (Site No. 061086) were analysed to characterise the local climate in the proximity of the Project. The Scone SCS is located approximately 37km northeast of the Project.

Wind speeds during the warmer months have a greater spread between the 9am and 3pm conditions compared to the colder months. The mean 9am wind speeds range from 6.7km/h in May to 10.0km/h in November. The mean 3pm wind speeds vary from 10.0km/h in May to 15.0km/h in November.

An annual windroses for the nearby Mangoola Coal mine operated meteorological station were analysed and show the predominant wind flows along a northwest to southeast axis which is typical of the Hunter Valley region of NSW. The most common winds on an annual basis are from the southeast and east-southeast, followed by the northwest and west-northwest. Few winds tend to originate from the northeast and southwest quadrants.

Detailed weather data and the annual windroses can be found in the full AQIA in **Appendix L**.

6.3.4. Assessment Methodology

As ambient air quality monitoring for the proposal was not available, publically available data from air quality monitors operated by the Mangoola Coal mine and the NSW EPA were used to quantify the existing background level for each of the assessed pollutants. **Figure 13** shows these monitoring locations relative to the Project area.

The period of data reviewed ranges from 2011 through 2014. The air quality monitors reviewed include the following:

- Dust Depositional Gauges;

Table 22 Estimated annual TSP emission rate - Operational activity

Activity	TSP emissions (kg/year)
Excavator loading Topsoil to haul truck	3
Hauling to Topsoil dump	38
Emplacing at Topsoil dump	3
Excavator loading Overburden to haul truck	53
Hauling Overburden to emplacement area	926
Emplacing at dump	53
Drilling gravel material	103
Blasting gravel material	51
Loading gravel material to crusher	263
Crushing gravel material	675
Screening gravel material	3,125
Unloading processed gravel material to stockpile	263
Rehandle processed gravel material at stockpile	263
Loading processed gravel material to haul truck	263
Hauling product gravel material offsite	37,478
Hauling product gravel material offsite - paved road	395
Wind erosion - whole site	37,493
Total	81,446

All sensitive receivers identified for the Project are likely to experience some level of existing dust impact due to the surrounding rural activities and operation of nearby coal mines including the Mt Arthur, Bengalla and Mangoola Coal mines.

When considering the existing background dust levels along with the summary of predicted dispersion modeling results shown in **Table 23**, the cumulative results for average annual PM_{2.5} and PM₁₀ would remain below the relevant criteria.

Table 23 Predicted dispersion modelling results for sensitive receivers

		PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	TSP (µg/m ³)	DD (g/m ² /mo)
Background Annual Average	Predicted	2.9	15.4	37.8	1.7
Incremental 24-hour Average	Predicted Range	0.03 – 1.02	0.27 – 8.08	-	-
Incremental Annual Average	Predicted Range	0.00 – 0.14	0.01 – 1.17	0.02 – 2.42	0.00 – 0.07
Cumulative Annual Average	Criteria	8	30	90	4
	Predicted Range	2.9 - 3.0	15.4 – 16.6	37.8 – 40.2	1.7 – 1.8

Assessment of cumulative 24-hour average PM₁₀ was conducted to examine the potential maximum total (cumulative) 24-hour average PM₁₀ impacts for the Project. The NSW EPA approach was applied at the most impacted sensitive receiver locations (R16 (owned by the Proponent) and R20 (owned by Mr Castle). The background data were the measured levels at the Wybong monitoring station to which was added the predicted background dust levels due to the Project to determine the total. This was done for each day of a full year.

The assessment indicates low potential for cumulative 24-hour average PM₁₀ impacts at the nearest and potentially most impacted sensitive receptor locations. Given these locations show little potential for any significant impacts to occur, there would also be little prospect of any significant impact to occur due to the Project at all other sensitive receptor locations.

Detailed tables of the full assessment results are provided in the AQIA in **Appendix D**.

Overall, the emissions of pollutants generated from diesel powered equipment at a quarry are considered to be too low to generate any significant off-site pollutant concentrations, especially in this case where the nearest receptors are located at least 1km away. Thus other pollutants generated from diesel combustion have not been assessed further in the AQIA.

A detailed discussion of modelling and methodology is discussed in Section 7 of the AQIA in **Appendix L**.

6.3.6. Air Quality Management and Mitigation Measures

It is predicted that all the assessed air pollutants generated by the Project would comply with the applicable assessment criteria at all sensitive receptors and therefore would not lead to any unacceptable level of environmental harm or impact in the surrounding area.

Nevertheless, the site would apply appropriate dust and air emission management measures (**Table 24**) to ensure it minimises the potential occurrence of excessive dust emissions from the site.

Overall, the assessment demonstrates that even using conservative assumptions, the Project could operate without causing any significant air quality impact at sensitive receptors in the surrounding environment.

Table 24 Air Quality Mitigation Measures

Measure No.	Mitigation measure
A1	Air quality management and mitigation measures will be outlined in an Operational Environmental Management Plan for the quarry.
A2	Activities to be reviewed during adverse weather conditions and modified as required to prevent or minimise dust generation.
A3	Visually monitor dust generation during construction and operation and modify activities or controls where excessive dust generation is observed.
A4	<p>Manage construction and operational activities to minimise generation of dust and air emissions and employ reasonable and feasible air emissions controls, such as:</p> <ul style="list-style-type: none"> • Covering vehicle loads containing dusty materials when travelling offsite • Implement watering or suitable alternative controls to minimise dust generation on haul roads, stockpiles and processing areas • Maintain and service vehicles according to manufacturer’s specifications • Switch off engines of vehicles and plant when not in use • Clean sealed haul roads regularly to reduce dust generation and tracking • Reduced disturbed areas exposed to wind erosion by staging quarry operations and minimising the time and area of forward stripping, and undertaking progressive rehabilitation where practicable

6.4. Noise and Vibration

A Noise and Vibration Impact Assessment (NVIA) was completed by Muller Acoustic Consultants (2015) to quantify potential acoustic impacts associated with operation of the quarry on the surrounding Hollydeen community. The full NVIA can be found in **Appendix M**.

The NVIA has been prepared in accordance with the following policies and guidelines:

- Environment Protection Authority (EPA) 2000, NSW Industrial Noise Policy (INP);
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, Road Noise Policy (RNP);
- Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG); and
- Australian and New Zealand Environment Conservation Council (ANZECC) 1990; Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.

6.4.1. Existing Noise Environment

To quantify the existing background noise environment of the area, unattended noise logging was conducted at two locations adjacent to The Golden Highway and Reedy Creek Road within the site property boundary. The locations are representative of receivers situated to the south in close proximity to the Golden Highway and of those receivers situated to the west and north of the project site.

The measurements were carried out using Svantek Type 1, 977 noise analysers from Monday 4 May 2015 to Wednesday 13 May 2015. Observations on-site identified the surrounding locality was typical of a rural environment, with wind, birds and intermittent traffic noise audible. **Table 25** summarises the background noise monitoring results.

Table 25 Background Noise Monitoring Summary

Catchment and Representative Receivers	Period	Measured Background Noise Level (LA ₉₀) RBL, dBA	Measured LAeq, dBA
L1(R14 to R22)	Day	42	57
	Evening	26	53
	Night	22	53
L2 (R1 to R13)	Day	29	56
	Evening	25	51
	Night	21	49

To gain a better understanding of the existing noise environment, attended noise monitoring was conducted at the unattended locations during calm clear weather conditions. The purpose of the measurements was to ascertain dominant ambient noise sources and to quantify any existing industrial noise contribution. It was noted that no existing industrial (or mining) noise was audible at the monitoring locations. The results of attended noise measurements and observations are summarised in **Table 26**.

Table 26 Operator -Attended Noise Survey Results, 4 May 2015

Monitoring Location	Time (hrs)	Primary Noise Descriptor (dBA re 20 µPa)			Description and SPL, dBA
		L _{Amax}	L _{A90}	L _{Aeq}	
L1	14:15	83	33	52	Rural Noise 30 to 35dBA Golden Highway Traffic 38 to 60dBA
L2	13:45	81	17	51	Traffic on Reedy Creek Rd 38 to 55dBA Rural Noise 15 to 30dBA

6.4.2. Noise Assessment Criteria

Only the daytime assessment period is relevant to this assessment as quarry operations will be limited to the daytime only. The recommended acceptable amenity levels from Table 2.1 of the INP have been adopted as the amenity criteria. The PSNLs for the quarry are presented in **Table 27**.

Table 27 Daytime Project Specific Noise Criteria, dBA LAeq(15minute)

Receiver	Measured =RBL LA90, dBA ¹	Intrusiveness Criteria LAeq(15minute), dBA	Amenity Criterion LAeq(period), dBA	PSNL
R1	30 (29)	35	50	35
R2	30 (29)	35	50	35
R3	30 (29)	35	50	35
R4	30 (29)	35	50	35
R5	30 (29)	35	50	35
R6	30 (29)	35	50	35
R7	30 (29)	35	50	35
R8	30 (29)	35	50	35
R9	30 (29)	35	50	35
R10	30 (29)	35	50	35
R11	30 (29)	35	50	35
R12	30 (29)	35	50	35
R13	30 (29)	35	50	35
R14	42	47	50	47
R15	42	47	50	47
R16	42	47	50	47
R17	39 ²	44	50	44
R18	39 ²	44	50	44
R19	39 ²	44	50	44
R20	42	47	50	47
R21	39 ²	44	50	44
R22	42	47	50	47

Note 1 : Where the RBL is lower than 30 dB(A), a RBL of 30 dB(A) is applied, the measured RBL is shown in brackets.

Note 2 : Adjusted down to take into account the additional offset distance to The Golden Highway.

The “Freeway/arterial/sub-arterial road” category as specified in the NSW EPA Road Noise Policy (RNP) was adopted for The Golden Highway (Merriwa Road) in this assessment. **Table 28** reproduces the road traffic noise assessment criteria reproduced from the RNP relevant for this road type.

Table 28 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of project/development	Assessment Criteria - dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub-arterial road	Existing residences affected by additional traffic on existing freeways/sub-arterial/roads generated by land use developments	60dBA, LAeq(15hour)	55dBA, LAeq(9hour)

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered. Receivers experiencing increases in total traffic noise levels above those presented in **Table 29** due to the addition of quarry vehicles on The Golden Highway should be considered for mitigation.

Table 29 Increase Criteria for Residential Land Uses

Road category	Type of project/development	Assessment Criteria - dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub-arterial road and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic LAeq(15hour) +12 dB (external)	Existing traffic LAeq(9hour)+ 12 dB (external)

Proposed construction of the access/haul road and intersection upgrade will be limited to daytime hours (ie. standard hours). Therefore, the criteria have been developed for nearby residential receivers based on standard hours for weekday periods. The project construction noise criteria for *RBL, dBA* is equal to the column titled “*Measured =RBL LA90,dBA¹*” in **Table 27**. The project construction noise criteria for *LAeq(15minute) dBA* is equal to 5 more than the results for each receiver in the column titled “*Intrusiveness Criteria LAeq(15minute),dBA*” in **Table 27**.

Cumulative ambient industrial noise should not exceed the levels specified in Table 2.1 of the INP. There are several existing industrial sources in the vicinity of Hollydeen, including Mangoola Coal approximately 5km to the northeast of site. Cumulative operational noise has been considered in this assessment and compared against the INP’s acceptable and recommended maximum amenity criteria levels. The acceptable and maximum amenity criteria levels are reproduced in **Table 30**.

Table 30 Ambient noise level amenity criteria

Type of Receiver	Indicative Noise Amenity Area	Period	Recommended L _{Aeq} (Period) Noise Level, dBA	
			Acceptable	Recommended Max
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45

The limits adopted by EPA for blasting are provided in the Australian and New Zealand Environment Conservation Council (ANZECC) - Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration. The limits address two main effects of blasting including airblast noise overpressure and ground vibration. These criteria are dealt with in detail in **Section 6.5** and **Appendix M** of this EIS.

6.4.3. Noise Impact Assessment

The quarry will operate during daytime hours only from 7am to 6pm, Monday to Friday, 8am to 1pm on Saturdays, with no operations on Sundays or Public Holidays. There are up to eight blast events proposed per year at the quarry.

The standard hours for construction activities is summarised in **Table 31**. These recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

Table 31 Standard Hours for Construction

Daytime	Construction Hours
Monday to Friday	7am to 6pm
Saturdays	8am to 1pm
Sundays or Public Holidays	No construction

Construction works away from the quarry area include the haul road construction and intersection upgrade to The Golden Highway. These activities have several differences when compared to extractive activities, including consisting of a short duration of works compared with the proposed quarry life and the construction location is geographically removed from the main extraction area.

A computer model was developed and used to assess potential noise impacts associated with the operation of the quarry. Four modelling scenarios were adopted in this assessment to represent noise emissions at various stages of the quarry life as the quarry progresses from east to west:

- Stage 1: Extraction of material from the eastern area of the pit;
- Stage 2: Initial extraction of material from the centre area of the pit;
- Stage 3: Initial extraction of material from the western area of the pit; and
- Stage 4: Extraction and blasting (equivalent to Stage 1 with drill rig).

6.4.3.1. Operational Noise

Daytime (7am to 6pm) quarry operations include quarrying, processing operations, product loading and transportation. The predicted noise levels at each residential receiver during calm meteorologic conditions for each stage of the quarry are provided in **Table 32**.

Construction activities within the extraction area, while limited, have not been reviewed separately in this assessment, as the noise associated with the processing and quarrying activities are similar to the associated construction emissions for this area.

The results of the model displayed in **Table 32** show that daytime noise emissions from the quarry for all stages satisfy the PSNL at all residential receivers.

Table 32 Daytime Predicted Operational Noise Levels, dBA LAeq(15minute)

Receiver	Stage 1	Stage 2	Stage 3	Stage 4	PSNL
R1	23	22	22	23	35
R2	<20	<20	<20	20	35
R3	<20	<20	<20	<20	35
R4	<20	<20	<20	<20	35
R5	<20	<20	<20	<20	35
R6	<20	<20	<20	<20	35
R7	20	20	20	21	35
R8	23	23	23	24	35
R9	20	21	21	21	35
R10	27	28	29	28	35
R11	22	23	23	23	35
R12	22	24	24	22	35
R13	22	24	25	23	35
R14	22	24	25	23	47
R15	30	31	34	31	47
R16	32	32	32	32	47
R17	26	27	28	27	44
R18	28	27	28	28	44
R19	26	26	26	27	44
R20	30	30	30	30	47
R21	24	24	24	25	44
R22	25	24	24	25	47

6.4.3.2. Traffic Noise

Product dispatch from the quarry will be up to 30 loads per day (60 movements). It has been conservatively assumed that all 60 truck movements travel along The Golden Highway, in one direction to and from site. The results of the traffic noise calculations are presented in **Table 33** and demonstrate the noise levels from quarry road trucks would remain below the relevant daytime criterion.

Existing ambient traffic noise levels for Golden Highway were calculated to be above the daytime criterion. The road noise calculations assume all traffic to and from site would be from one direction on the Golden Highway, therefore, the results should be considered conservative.

The traffic noise contribution from the quarry is predicted to be negligible compared to existing Golden Highway traffic. At the nearest privately owned residences the RNP criterion is predicted to be satisfied. Additionally, existing road traffic noise levels are not increasing by more than 2 dB and satisfy the relative increase noise criterion.

Table 33 Operational Road Traffic Noise Levels - Daytime (7am to 10pm)

Distance to Nearest Receiver(m)	Assessment Criterion	Existing Noise – Golden Highway	Additional Site Traffic Noise ²	Existing & Future Quarry Combined Total
Day LAeq(15hour), dBA				
20	60	63 ¹	43	63
100	60	56 ³	37	56

6.4.3.3. Construction Noise

Predicted LAeq(15minute) noise emissions for construction satisfy relevant construction noise criteria for all assessed receivers. **Table 34** presents the results of the construction noise model assessment.

Table 34 Daytime Predicted Construction Noise Levels, dBA LAeq(15minute)

Receiver	Predicted LAeq(15minute) noise levels, dBA	Criteria LAeq(15minute), dBA
R1	<20	40
R2	<20	40
R3	<20	40
R4	<20	40
R5	<20	40
R6	<20	40
R7	<20	40
R8	<20	40
R9	<20	40
R10	<20	40
R11	<20	40
R12	<20	40
R13	<20	40
R14	<20	52
R15	24	52
R16	46	52
R17	24	49
R18	36	49
R19	35	49
R20	45	52
R21	32	49
R22	31	52

6.4.3.4. Blasting

Blasting is proposed for the Project up to 12 times per year, but typically 8 or less times per year. Airblast overpressure and vibration from blasting has been quantified for the project and is presented in **Section 6.5** and **Appendix N** of this EIS.

Results of the blast calculations identify that adopting an MIC of up to 100kg will satisfy the relevant ANZECC criteria at the nearest residential receivers for both overpressure and vibration.

6.4.3.5. Cumulative Impacts

The cumulative noise assessment has reviewed existing industrial noise in the locality surrounding the proposed quarry.

Existing daytime noise levels in the catchment surrounding the quarry identified existing mining noise levels as inaudible. It is reiterated that the daytime attended noise survey at location Logger 2 resulted in an ambient LA90 noise level of 17dBA.

The predicted contribution of quarry noise to the surrounding catchment is generally <35 dBA. Therefore, the overall change to existing industrial noise levels is expected to remain below 35dBA and satisfy the INPs daytime amenity criteria of 50dBA, LAeq(period) for rural receivers.

6.4.4. Noise Monitoring and Management

Management and mitigation measures to address potential noise impacts are listed in **Table 35**.

Table 35 Noise Mitigation Measures

Measure No.	Mitigation measure
N1	Operational and construction working hours would be restricted to 7 am and 6 pm (Monday to Friday) and 8 am and 1 pm (Saturdays).
N2	All site workers (including subcontractors and temporary workforce) would be made aware of the potential for noise and vibration impacts upon local residents and encouraged to take practical, feasible and reasonable measures to minimise noise during the course of their activities.
N3	The operator would establish suitable means for contacting and engaging with the local residents and will give prior notice of planned blasting activities.
N4	Noise monitoring would be undertaken and reported as specified in the EPL requirements.
N5	A contact phone number will be provided to neighbours so that they may contact the operator if they have concerns over noise emissions or other matters.

6.5. Blasting Assessment

A blasting assessment was undertaken by Peter Bellairs Consulting Pty Ltd (2015) to provide information about indicative blasting design, assessment of blasting impacts and impact mitigation strategies. The assessment was undertaken in accordance with the *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC 1990). The Blasting Assessment report is included in **Appendix G**.

6.5.1. Overview

It has been identified that a significant proportion of the resource is too hard for conventional dozer ripping and that blasting will be required to extract the resource.

An initial blasting design has been prepared that includes two initial drill and blasts on a 10m or 15m bench height. Based on the planned extraction rate a maximum of twelve but typically 8 blast events per year only would be required. Blasting would be very small in scale and infrequent, and insignificant compared with the blasting by major coal mines in the area. Blasting would be avoided during adverse meteorological conditions and blast monitoring would be undertaken in accordance with approval conditions.

It is suggested that blasting generally be undertaken in the afternoon prior to 3pm to enable misfire remediation in the unlikely event of a misfire occurring, and to avoid morning conditions when temperature inversions may be in place.

Blasting will generally be typical open cut free face blasting, well sorted crushed angular aggregate of a nominal size of 9mm (1 to 11mm) will be used as stemming to minimise air overpressure and a good quality drill and blast provider with a proven track record in quarry and construction blasting with suitable systems and procedures vetted by the RMS for close in blasting as well as all appropriate licences will be used. Blasting will be undertaken to meet all legislative (NSW Explosives Act 2003), regulatory (NSW Explosives Regulation 2013), Australian Standards (specifically AS2187.2-2006) and Codes of Practice as a minimum including ANZECC Guidelines 1990 and licence conditions with respect to blasting. There is no need to store explosives or explosive precursors on site as they will be mobilised to each blast with any excess return to the drill and blast contractors or the explosive supplier's premises.

6.5.2. Blasting Emissions Criteria

Following are the blast induced ground vibration and overpressure licence limits that conform to the ANZECC Guideline 1990:

1. For blast induced ground vibration that 95% of the blasts in a year will be less than or equal to 5mm/s PPV with 5% of the blasts having vibrations greater than 5mm/s PPV but less than or equal to 10mm/s with no blast induced vibration greater than 10mm/s; and
2. For blast induced air overpressure that at least 95% of the blasts in a year will be less than or equal to 115dB_L with a maximum of 5% of the blasts having air over pressures greater than 115dB_L but less than or equal to 120dB_L with no blast exceeding 120dB_L.

6.5.3. Blasting Impact Assessment

The blasting assessment and impact report in **Appendix H** details the following information:

- A drill and blast design applicable for the site;
- Ground vibration estimation based on the drill and blast design;
- Blast induced air overpressure estimations based on the drill and blast design;

- Blast induced ground vibration and air overpressure limits based on the technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC, 1990);
- Proposed hours, the frequency and the methods of blasting;
- Assessment of the likely blasting impacts on people, animals, buildings and significant natural features (ANZECC 1990);
- Measures to mitigate ground vibration and blast induced air overpressure including those associated with temperature inversions; and
- Risk mitigation required to avoid false blast induced air over-pressure readings due to wind.

The assessment of the likely impacts of blasting is as follows:

- People: minimal due to the low vibration and air overpressures to be generated and the lack of after blast NOx fumes. Wind will generate far more air overpressure than blasting;
- Animals: minimal as once they become used to blasting and determine it poses no threat then they are not affected by the proposed low levels of vibration or air overpressure expected;
- Buildings are extremely unlikely to be damaged as the environmental licence limits are for human quality of life and these are well below those that cause damage to buildings;
- Infrastructure is highly unlikely to be damaged; and
- Significant natural features are not likely to be damaged.

The assessment found that the criteria for blast induced ground vibration and air overpressure are readily achievable and that impacts due to blasting should be negligible.

6.5.4. Blasting Monitoring and Management

Management and mitigation measures to address potential blasting impacts are listed in **Table 36**.

Table 36 Blasting Mitigation Measures

Measure No.	Mitigation measure
B1	Blasting will be undertaken between the hours of 9am to 5pm Monday to Saturday with no blasting on Sundays or public holidays.
B2	All blast monitoring will be undertaken as per the requirements specified in AS 2187.2 - <i>Australian Standard Explosives - Storage and Use</i>
B3	Monitoring will be undertaken if required in accordance with the conditions of the EPL.
B4	Blasting will not take place more than once per day except if a misfire occurs and as this is a safety issue may require a second blast to re-fire the misfired portion of the blast on the same day.
B5	A blasting management plan would be developed that includes the following: <ul style="list-style-type: none"> • Conditions from the EPL • Measures from the blast assessment in Appendix F; • Management measures for ground vibration management; • Management measures for blast induced air overpressure risk mitigation; and • Consultation with potentially affected sensitive receivers.

6.6. Surface Water

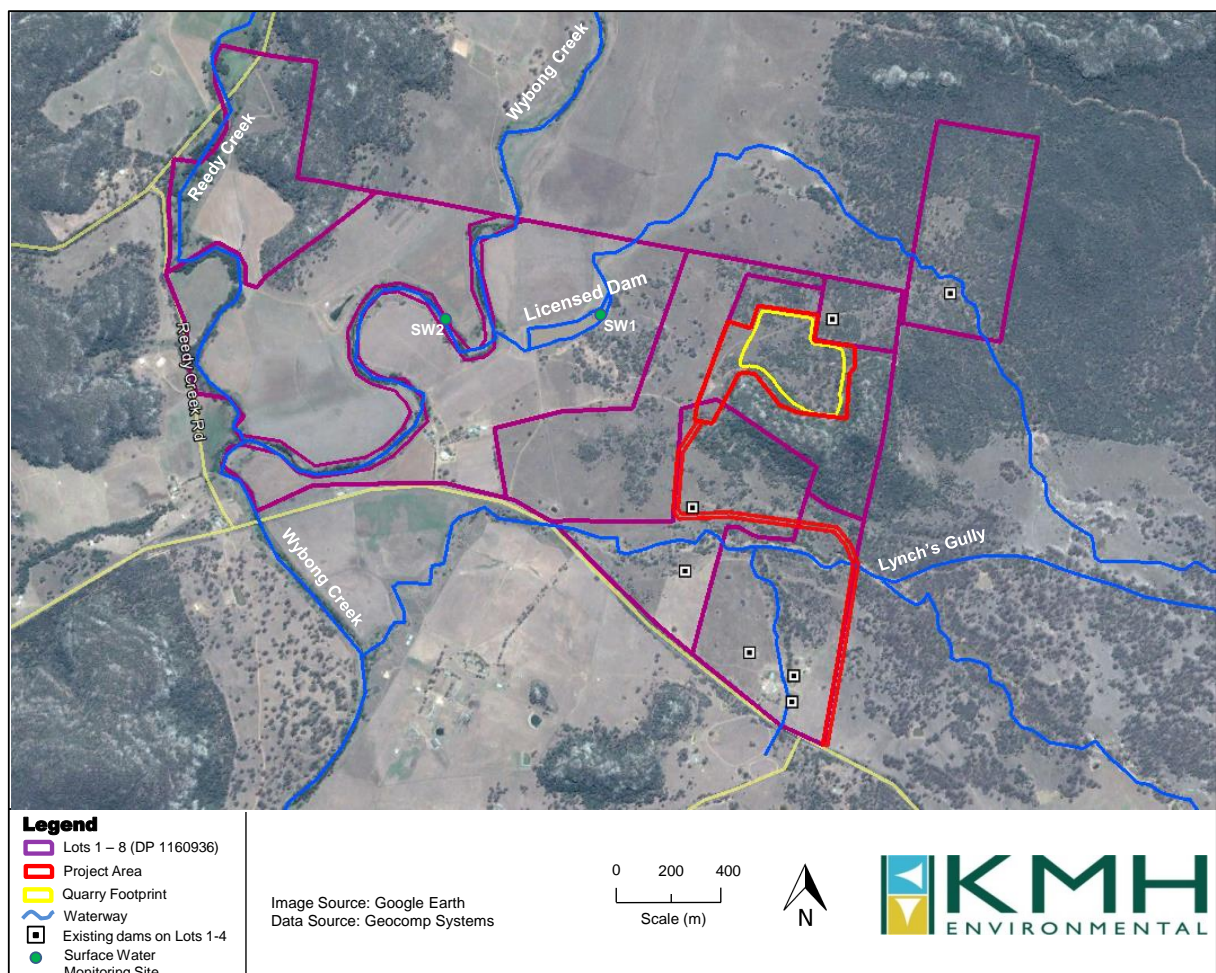
This section describes the existing surface water conditions of the Project Area based on desktop research, topographical maps and on-site investigations including collected surface water monitoring data. The proposed water quality objectives and potential impacts of the Project are described, and the proposed erosion and sediment controls and water management principles are detailed.

6.6.1. Overview

The dominant surface water drainage feature of the area is Wybong Creek, a tributary of Goulburn River, which occurs approximately 1 km west of the proposed quarry (**Figure 14**). The property drains to Wybong Creek mainly via sheet flow over gently sloping north, north-west and south-facing slopes. There are several small dams on the Dolwendee property and one large licensed dam on the adjoining Hollydene property which any runoff from the quarry area would ultimately drain to.

To the south of the proposed quarry area a prominent rocky ridgeline ranging between 210m and 220m in elevation forms the main drainage catchment boundary influencing the proposed quarry area.

This Chapter reviews the local drainage features, describes the existing water quality and discusses drainage constraints related to the proposed quarry.



Source: Google Earth

Figure 14 Local Surface Water Drainage Features and Monitoring Locations

6.6.2. Existing Environment

An intermittent creek (Lynch's Gully) occurs in the southern part of the property and drains to the west to Wybong Creek. Lynch's Gully is considered a 2nd order stream (Strahler classification) and displays some gully erosion and has been the subject of soil conservation works in the past. Lynch's Gully would be considered as Class 4 unlikely fish habitat with intermittent flows and no permanent aquatic habitat. The proposed haul road would cross Lynch's Gully and a new culvert is proposed for this purpose (refer **Photograph 9**).

The proposed extraction area is not located near any existing drainage lines. The nearest watercourse to the proposed quarry is more than 400 m to the north, an intermittent first order watercourse that is highly disturbed with no appreciable riparian vegetation and located within cleared grazing land. Any stormwater discharge from site would need to travel overland more than 400 m before reaching the nearest watercourse and would then drain to the large licensed dam (refer **Photograph 13**) on the Hollydene property owned by the Proponent. The nearest waterway with any intact riparian habitat is Wybong Creek.

There are approximately seven small dams spread across Lots 1 through 4 within DP 1160936 though none are within the Project Area.

6.6.3. Surface Water Quality

Surface water samples were collected by RCA on 22 January 2015 and 6 May 2015 from two separate locations including Wybong Creek and the large dam west of the Project, both downstream of the proposed quarry activities. The surface water sampling sites are indicated in **Figure 14**. There was no available 'upstream' sampling site as the quarry is high in the catchment with no permanent water sources upstream.

The samples were analysed for a variety of physical and chemical parameters including nutrients, dissolved metals, pH and electrical conductivity.

The results show some significant differences in water quality between the dam and Wybong Creek:

- Dissolved heavy metals concentrations in the dam are higher than in Wybong Creek. Several dissolved metals in the dam water exceeded the relevant criteria in ANZECC (2000) Australian and New Zealand Guidelines for Fresh Water Quality, for 95% level of protection. The metals concentrations also show some considerable variability. Metals concentrations in Wybong Creek were non-detectable;
- Salinity and Electrical Conductivity was significantly higher in Wybong Creek than in the dam. The dam water was non-saline with EC levels less than 200 $\mu\text{S}/\text{cm}$;
- Turbidity in the dam is much higher than in Wybong Creek.

The water quality results from SW1 and SW2 are presented in **Table 37**.

Table 37 Surface Water Quality Field and Laboratory Results

Analyte	Units	LOR	ANZECC Criteria	22/01/2015		6/05/2015	
				SW1 Dam	SW2 Wybong Cr.	SW1 Dam	SW2 Wybong Cr.
Field data							
Appearance				brown, turbid	clear	brown, turbid	clear
pH	-			7.67	8.26	7.29	7.85
Electrical conductivity	mS/cm			0.156	1.13	0.076	2.39
turbidity	NTU			122	11	140	19

Analyte	Units	LOR	ANZECC Criteria	22/01/2015		6/05/2015	
				SW1 Dam	SW2 Wybong Cr.	SW1 Dam	SW2 Wybong Cr.
Dissolved oxygen	mg/L			4.93	4.68	5.64	4.64
Temperature	°C			25.5	25.4	17.0	16.7
Salinity	%			0.00	0.05	0.00	0.11
Lab Data							
Hydroxide Alkalinity as CaCO3	mg/L	1		<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1		<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1		39	268	21	345
Total Alkalinity as CaCO3	mg/L	1		39	268	21	345
Sulfate as SO4 - Turbidimetric	mg/L	1		<1	21	<10	12
Chloride	mg/L	1		16	580	31	661
Calcium	mg/L	1		4	89	2	102
Magnesium	mg/L	1		3	116	2	124
Sodium	mg/L	1		18	234	15	231
Potassium	mg/L	1		8	6	3	5
Arsenic (dissolved)	mg/L	0.001	0.013	0.002	<0.001	<0.001	<0.001
Cadmium (dissolved)	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (dissolved)	mg/L	0.001	0.001	0.022	<0.001	0.004	<0.001
Copper (dissolved)	mg/L	0.001	0.0014	0.014	<0.001	0.004	<0.001
Lead (dissolved)	mg/L	0.001	0.0034	0.002	<0.001	<0.001	<0.001
Nickel (dissolved)	mg/L	0.001	0.011	0.025	<0.001	0.006	0.001
Zinc (dissolved)	mg/L	0.005	0.008	0.023	<0.005	0.038	<0.005
Mercury (dissolved)	mg/L	0.0001	0.0006	<0.0001	<0.0001	<0.0001	<0.0001
Ammonia as N	mg/L	0.01	0.9	0.2	0.03	0.06	0.04
Nitrate + Nitrite	mg/L	0.01	0.7	0.2	0.03	0.07	0.01
Total Kjeldahl Nitrogen as N	mg/L	0.1		2	0.3	1.4	0.3
Total Nitrogen as N	mg/L	0.1		2.2	0.3	1.5	0.3
Total Phosphorus as P	mg/L	0.01		0.44	0.17	0.28	0.12
Biochemical Oxygen Demand	mg/L	2		5	3	4	<2
Total Anions	meq/L	0.01		1.23	22.2	1.29	25.8
Total Cations	meq/L	0.01		1.43	24.3	0.99	25.5
Ionic Balance	%	0.01			4.66	----	0.62

6.6.4. Water Quality Objectives

The NSW Water Quality Objectives are the agreed environmental values and long-term goals for NSW's surface waters. The objectives are consistent with the agreed national framework for assessing water quality set out in the ANZECC 2000 Guidelines.

The local water quality objectives of Wybong Creek fall under the uncontrolled streams and waterbodies, and the flow patterns have been altered through land-use change and extraction.

The Water Quality Objectives of Wybong Creek are the protection of:

- Aquatic ecosystems
- Visual amenity
- Secondary contact recreation
- Primary contact recreation
- Livestock water supply
- Irrigation water supply
- Homestead water supply
- Drinking water at point of supply-Disinfection only
- Drinking water at point of supply-Clarification and disinfection
- Drinking water at point of supply-Groundwater
- Aquatic foods (cooked)

The River Flow Objectives of Wybong Creek are:

- Protect pools in dry times
- Protect natural low flows
- Protect important rises in water levels
- Maintain wetland and floodplain inundation
- Maintain natural flow variability
- Manage groundwater for ecosystems
- Minimise effects of weirs and other structures

The trigger values and criteria to maintain the water quality objectives are described in **Section 6.6.12** and are relevant to any proposed controlled stormwater discharge from the Project.

6.6.5. Salinity

The Hunter River Salinity Trading Scheme (HRSTS) uses a tradeable salinity credit system to schedule saline industrial discharges to improve and sustain the quality of Hunter River water.

As saline wastewater discharge is not proposed for the Project, a tributary impact assessment has not been included. Water collected in sediment basins and the quarry excavation is proposed to be re-used onsite to meet water requirements for operation of the quarry.

In terms of using water on-site, the water quality results from the dam show that the salinity of the on-site water is low and suitable for reuse.

6.6.6. Potential Impacts

Potential impacts that could arise from the Project include the following:

- Sediment-laden runoff from active extraction and processing areas, overburden emplacements, stockpiles, haul roads and other disturbed areas could discharge to waterways and impact receiving water quality;
- Stormwater contamination from processing plants, workshops, vehicle wash-down areas, leaks and spills of fuels and oils, etc.;

- Elevated salinity levels, as underground extraction can disrupt saline aquifers or allow salt to be leached from freshly shattered overburden;
- Reduction in stormwater runoff to receiving waters, due to onsite capture and containment of stormwater within the quarry.

The key potential surface-water contaminant from extractive industries involving non-metalliferous ores such as is proposed here, is sediment or 'total suspended solids' (TSS) generated by soil erosion from lands disturbed by quarrying activity. Failure to properly manage stormwater runoff may cause erosion from haul roads, exposed soil and stockpiles that could potentially impact (via sedimentation) the water quality of Lynch's Gully, Wybong Creek and the Goulburn River. Clean water surface drains installed above the proposed quarry footprint will have the potential to result in localised areas of increased stormwater runoff and erosion. Potential uncontrolled discharges of sediment laden water from on-site basins and/or the quarry pit could impact existing watercourses if not managed properly.

As the quarry develops progressively so the area of disturbance will increase, increasing the erosion potential. There is no identified risk of acid mine drainage from the Project which does not involve extraction or exposure of metal-sulfide ores.

The progressive expansion of operations in the proposed quarry footprint will effectively result in an increase in on-site water storage capacity. Over time, this will result in a minor reduction in off-site surface water discharges from this area.

The ecology assessment concluded that there were no riparian lands or Groundwater Dependent Ecosystems (GDE's) mapped within the Project Area or within the Lots 1 through 4 that could be impacted by the Project.

Due to the relatively small scale of the Project, and with implementation of an effective soil and water management plan, there is a very low risk of offsite impacts to water resources including to surface water flows, water quality, channel stability or the hydraulic regime of the Project Area or downstream. The nearest watercourse downstream of the proposed quarry is further than 400 m away and there is a very low risk of the quarry causing adverse impacts on the receiving waters due to its design (being internally draining), large buffer distance to waterways and the expected high level of efficacy of the proposed soil and water controls.

6.6.7. Surface Water Quantity and Catchment Flows

An analysis of catchment hydrology and harvestable rights, and a water balance for the Project, are provided in Section 6.7. In simple terms, the proposed quarry has a footprint of approximately 11 hectares that would be internally draining. This represents a very small loss in the context of the overall catchment area of Wybong Creek which is many thousands of hectares in area. At a more local scale, the large licensed dam on Hollydene has a catchment area of approximately 600 ha. The loss of drainage catchment to this dam represented by the fully developed quarry represents a loss of just 1.7%.

6.6.8. Quarry Water Management

Because of the relatively long period of operation (> 20 years), the management of surface water would focus on the use of stable and long term clean water diversions, progressive stripping of topsoil and overburden from planned extraction areas, capture and containment of dirty water in operational areas using sediment basins and informal sumps, and control of erosion from high hazard areas such as areas of concentrated water flows (drains) and steep slopes.

Thus there would be an emphasis on appropriate soil and water management principles:

- erosion control, as a pollution prevention strategy;
- runoff separation by diverting 'clean' stormwater runoff around the site or away from operational areas;

- capturing of dirty water for treatment and reuse; and
- management and maintenance of long-term controls.

6.6.9. Soil and water management plan

The design and operation of erosion and sediment controls and drainage systems during the construction, operation and closure rehabilitation stages would be undertaken in accordance with best practice quarry planning and design guidelines.

A detailed soil and water management plan (SWMP) would be prepared following development approval (in line with existing operational plans). The SWMP would be prepared in accordance with *relevant best practice guidelines, in particular Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom, 2004) (the "Blue Book") and Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and Quarries (DECC, 2008).*

The SWMP would include:

- a Drawing (or Drawings) showing (among other things) the site layout, location of sensitive areas such as waterways and native vegetation, drainage patterns, stockpile areas, extent of earthworks, restricted zones, site access paths, proposed roads and other hardstand areas, and the approximate locations of the suite of erosion and sediment control best management practices (BMPs) that are to be used at the site;
- a Commentary to accompany the Drawings/s that describes how erosion control and soil and water management will be achieved on site, including ongoing management and maintenance of structures;
- an assessment of the physical constraints to land development including the erosion hazard;
- calculation for sizing sediment basins based on specific stages of operation and the changing needs as the quarry develops; and
- engineering details and design calculations for all necessary sediment basins and other major soil and water management structures, including clean water diversion drains.

Site specific erosion and sediment control strategies would include:

- Clean water catchment runoff would be diverted around the quarry pit to prevent/minimise upslope runoff flowing into the operational areas;
- Drainage systems would be suitably designed and engineered to operate for the life of the quarry and not cause erosion. This would include scour protection of open drains as required and energy dissipaters / level spreaders located at drain outlets;
- The final quarry geometry, to the extent practicable, would allow free drainage of surface runoff while minimising erosion;
- Vegetation removal and stripping would be undertaken progressively to minimise the operational area exposed at any one time. This would help reduce the potential for erosion and the extent and capacity of erosion and sediment control measures required;
- Sediment-contaminated stormwater would be kept separate from clean water flowing from undisturbed areas;
- Dirty water diversions in areas of disturbance would be used to divert sediment laden runoff into sediment basins. Design of temporary surface-water collection, conveyance and disposal systems would be undertaken in accordance with Blue Book standards and in a manner which minimises erosion;
- Re-use of surface water runoff would be a part of the overall water-management strategy for the site to avoid or reduce discharge of polluted water. There are commonly a range of non-potable water uses on the Project such as dust suppression and process water. **Section 6.7** discusses the potential for water re-use on-site and the overall water balance of the Project.

- The proposed haul road would be designed and constructed using good engineering practice for mines and quarry haul roads and in accordance with *Managing urban stormwater: soils and construction*, volume 2C: *unsealed roads* (DECC 2008b), and consistent with the NSW Guidelines for Controlled Activities, where applicable. Appropriate temporary erosion and sediment controls would be employed during haul road construction; and
- Erosion and sediment control measures and diversion drainage systems would be inspected regularly with maintenance and modification as needed. A more intense inspection and maintenance regime would occur during periods of wet weather and wet-weather clean-up.

Figure 15 provides a Conceptual Soil and Water Management Plan describing the key elements of the expected soil and water management regime around the proposed quarry. This would be subject to refinement in line with the operational plans.

6.6.10. Clean Water Drain

A clean water drain would be constructed around the southern (upslope) side of the proposed quarry, as close as practicable to the planned limit of extraction. This drain may be incorporated with the safety bund that would be in a similar location. The drain would be designed in accordance with the Blue Book, to convey flows up to the design storm event in a non-erosive manner. This may require hard armouring in certain areas. Level spreaders (or equivalent) would be installed at the drain outlet to manage erosion and return flows to a non-erosive velocity.

6.6.11. Staged soil stripping and management

Soil stripping and stockpiling is important for soil and water management at a mine or quarry during both the operational and rehabilitation phases. The stockpiles need to be managed to minimise erosion and loss of valuable topsoil for rehabilitation, and also to ensure the topsoil is maintained in a condition which supports the most rapid stabilisation of the site during rehabilitation.

The following measures should be adopted for soil stripping and stockpiling:

- soils would be stripped in a slightly moist condition (neither too dry nor wet) when practicable thus reducing dust generation and deterioration in topsoil quality;
- topsoil would be stockpiled for later use in rehabilitation, or for immediate rehabilitation of bunds;
- soil stockpiles would be located to avoid areas of concentrated water flow; and
- stockpiles should be trimmed, scarified and immediately sown with permanent pasture species to reduce erosion and minimise weed establishment.

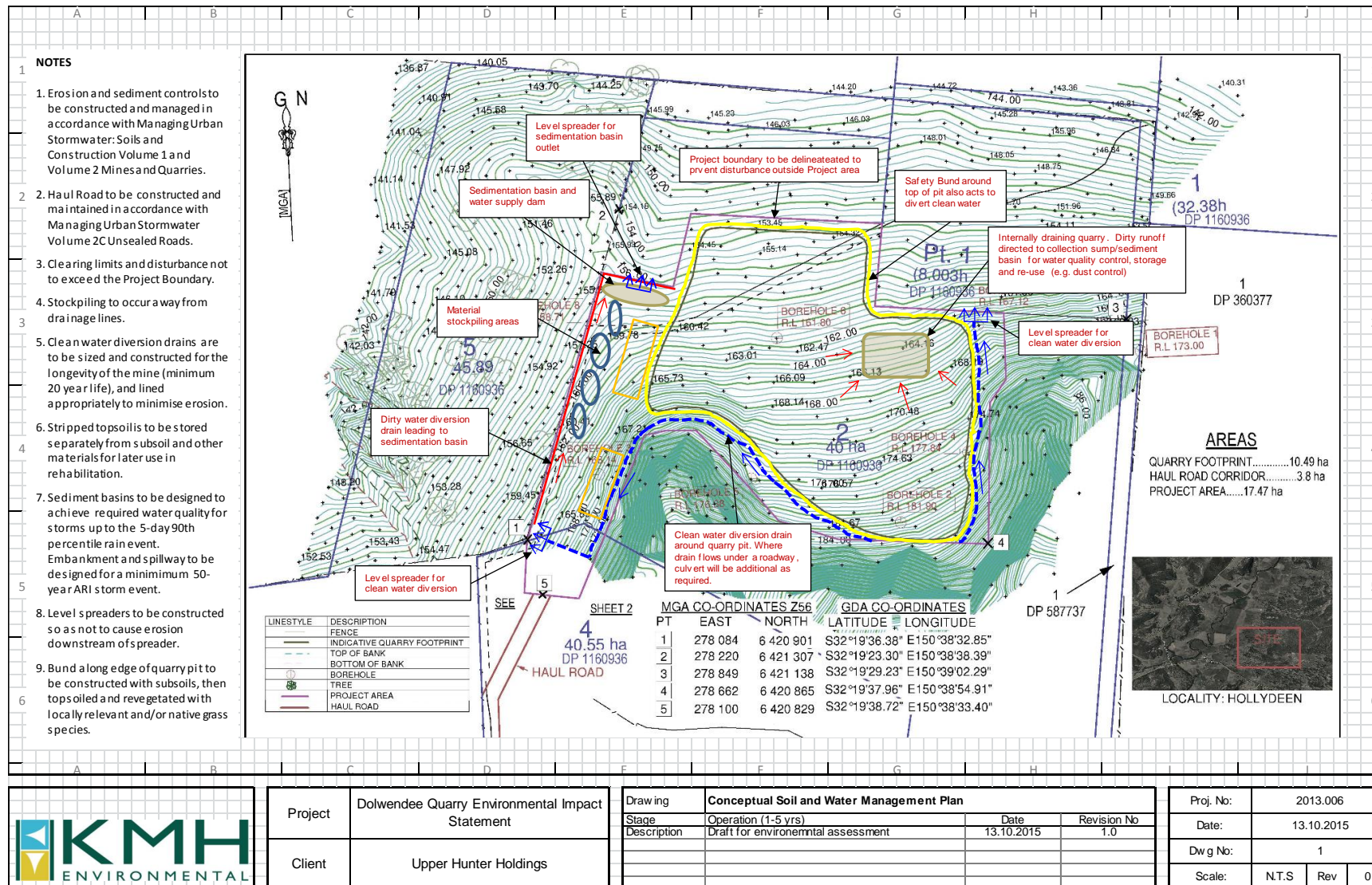


Figure 15 Conceptual Soil and Water Management Plan

6.6.12. Sediment Basins

Sediment basins and associated dirty water drains would be established below key operational areas as required to reduce dirty water runoff from the site. This would include below the processing and stockpiling areas. Sediment basins and informal sumps would also be located within the active extraction area to capture dirty runoff and assist in operational drainage for efficient operations. The sediment basin/s within the quarry would also serve as water storage for reuse.

A sediment basin or suitable containment bund would be established at the base of the topsoil/overburden pre-stripping stages of the quarry. This is likely to be in operation only for a relatively short period as once the quarry develops it would be internally draining and below the natural ground surface, eliminating the risk of uncontrolled dirty water discharge out of the quarry. Once established, the role of internal sediment basins within the quarry would be dual purpose. They would efficiently capture and control dirty water runoff within the quarry while providing a valuable water storage from which water would be taken for reuse.

Discharge of water from sediment basins is expected to be infrequent as the water management system would be designed to optimize storage for reuse for operational purposes (e.g. dust control, revegetation etc.). However, there occasionally could be significant rainfall events that require the treatment and discharge of collected water in sediment basins.

Managed discharges of water from sediment basins would be undertaken in accordance with relevant best practice guidelines, any EPL conditions and the Blue Book. Indicative water quality targets for managed discharges resulting from rainfall events up to the 5-day design rainfall depth are:

- 50 mg/L Total Suspended Solids (TSS)
- No visual oil and grease; and
- pH between 6.5 and 8.5.

An indicative sizing of sediment basins is summarised in **Table 38** based on various potential disturbed catchment area sizes. No discharge of water off-site would be planned to be undertaken as all water would be re-used for dust control and/or moisture treatment of material products on-site.

Table 38 Nominal Catchment Area Sediment Basin Sizing

Sediment Basin Calculated Volumes	Disturbed catchment area (ha)			
	1	2	3	5
Sediment basin storage, sediment storage volume	22m ³	43m ³	65m ³	108m ³
Sediment basin, settling zone volume	230m ³	460m ³	689m ³	1149m ³
Sediment basin total volume	252m³	503m³	754m³	1257m³

6.6.13. Water Monitoring

Given the large distances that exist between the proposed quarry and the receiving waters, and the low risks posed to catchment water quality, there is no justification for implementing a catchment water quality monitoring regime in association with quarry operations. Water discharges from the quarry are expected to be infrequent and irregular as the majority of captured water would be retained onsite for reuse. Water monitoring would be undertaken prior to any planned discharge to ensure that water quality targets are being met.

6.6.14. Mitigation Measures

Management and mitigation measures to address potential surface water impacts are listed in **Table 39**.

Table 39 Surface Water Mitigation Measures

Measure No.	Mitigation measure
SW1	A detailed soil and water management plan (SWMP) would be prepared following development approval (in line with existing operational plans). The SWMP would be prepared in accordance with relevant best practice guidelines, in particular <i>Managing Urban Stormwater: Soils and Construction, Volume 1</i> (Landcom, 2004) (the “Blue Book”) and <i>Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and Quarries</i> (DECC, 2008).
SW2	Clean water diversion drains would be established to catch and convey clean surface water around the quarry and discharge this as overland flow into undisturbed areas below the Project area. Drains would be designed in accordance with the Blue Book.
SW3	Dirty water runoff from operation areas would be diverted to suitably sized sediment traps or basins, designed in accordance with the Blue Book, with captured water reused in quarry operations.
SW4	Managed discharges of any surplus water captured within the quarry site would be undertaken in line with EPL conditions. Discharged water quality would be equal to or better than: <ul style="list-style-type: none"> • 50 mg/L Total Suspended Solids (TSS) • No visual oil and grease; and • pH between 6.5 and 8.5.
SW5	A Discharge Procedure would be developed to describe the operational procedures for managed water discharges, including water quality targets, treatment procedures to achieve these targets and monitoring methods to demonstrate compliance
SW6	An erosion and sediment control plan (PESCP) would be prepared for construction of the haul road

6.7. Water Access and Water Balance

6.7.1. Overview

A range of water management issues need to be considered at mines and quarries, including the use and availability of water for:

- dust suppression;
- site revegetation;
- material processing;
- washing or separation of extracted materials (if applicable); and
- appropriate control and management of stormwater runoff.

These water needs of the Project would be viewed within a broader context of an integrated water-management framework that seeks to minimise the importation of water from outside the site, prevent or limit the degradation of downstream environments and meet on-site water needs.

6.7.2. Existing Environment

On the Dolwende property there are seven farm dams (refer **Figure 14**). An estimate of dam sizes was undertaken based on surface areas calculated from aerial photos, estimated depths and internal batter gradients. The dams are mostly quite small and less than 1 ML in size, with one larger dam in the order of 3 ML near the Dolwende homestead. The total capacity of the farm dams on Dolwende estate is approximately 7.7 ML. It is not planned to use water from any of these dams for quarry operations.

6.7.3. Water Sharing Plan

The Project is located within the Water Sharing Plan for the Wybong Creek Water Source 2003, which applies to surface waters and groundwater in the alluvial sediments within the plan area.

The Water Sharing Plan for Wybong Creek Water Source commenced on 1 July 2004 and was suspended on 18 August 2006. This water sharing plan was due for extension/replacement in July 2014. In May 2014, the Minister approved the extension of the plan until its date of replacement (by 1 July 2015 or sooner) and it is now proposed to be merged with the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources resulting in a single water sharing plan covering the unregulated water sources in this catchment.

6.7.4. Existing Water License

Upper Hunter Holdings (UHH) holds water license 20CA212769 for water supply works comprising a 80mm centrifugal pump on Lot 6 DP 1160936 and authorising the abstraction of up to 142 ML per year from the Wybong Creek water source. The permitted use is Industrial and covers Lots 3 and 4 in DP 1160936.

UHH would seek to amend the license to permit the use of water on Lot 2 also to provide a backup water supply for quarry operations.

6.7.5. Harvestable Rights

The Harvestable Right provisions of the *Water Management Act 2000* give landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.

The maximum harvestable rights dam capacity was calculated for the Dolwende property being Lots 1, 2, 3 and 4 in DP 1160936 (with a combined area of 161.48 hectares), on which the Project is located, using the NSW Government's Maximum Harvestable Right Farm Dam Capacity Calculator, accessed via the NSW Government's natural resources website (<http://registers.water.nsw.gov.au/wma/mhrdcalc/main.jsp>).

The maximum harvestable rights dam capacity for Lots 1 – 4 is 10.4962 Megalitres (ML). The seven existing dams on-site have an estimated total capacity of 7.7 ML. On this basis the property has the ability to construct additional dams with storage totalling approximately 2.8 ML without exceeding the MHRDC.

It is noted that sediment basins constructed for the purpose of water quality control would not count toward the harvestable rights allowance, providing water is not pumped or taken from those dams for use.

6.7.6. Water Demand

Water would be required in different parts of the quarry for a range of purposes, including:

- toilets and basins;
- vehicle and equipment washing;
- dust suppression on haul roads;
- dust suppression and moisture addition to stockpiled aggregates and
- dust suppression and general cleaning and maintenance at the crushing and screening plant; and
- supply of moisture in blended products.

The vast majority of water required to operate the quarry does not need to be high quality. These water demands would be met primarily by harvesting of stormwater from sediment basins employed throughout the Project area.

The following sections describe and quantify the main water demands and sources. The water use estimates are indicative only.

Potable Water

Potable water is used for toilet and hand basin use, dishwashing, showering and drinking. An estimated average of 40 litres per person per working day is required for these uses. The site workforce is typically up to 4 staff per day; therefore, the daily potable water demand is approximately 160 L/day. This equates to approximately 48 kL/year. Potable water would be supplied by onsite roof water collection or imported to site by water tanker or containerised water.

Truck Washing Facilities

Mobile plant used in quarry operations (e.g. trucks, loaders, water carts, excavators) would be hosed down periodically as part of general maintenance and prior to servicing. A dedicated wash bay would be established with high pressure hose. It is estimated that the wash bay may be used on average up to 3 times per day for five minutes at a time, at a flow rate of approximately 5 L/minute.

Predicted average daily water use is approximately 125 L, which amounts to approximately 37.5 kL/year. Wash water would be drained to a sediment basin for capture and further reuse.

Dust Suppression and Product Moisture – Stockpiles

Sprinklers on standpipes would be distributed strategically throughout the main stockpile area and used to water the stockpiles to suppress dust and maintain a level of product moisture required for the particular product and client demand. The sprinklers would be supplied with water from holding tanks or sediment dams, via a pumped pipeline.

The sprinklers would be operated an estimated 150 days per year. It is estimated that up to 100 kL per day may be used when sprinklers area in operation. This is based on an estimated watered area of 2 ha applying 5mm of water per day to this area. The annual volume of water used by the stockpile sprays would be approximately 15,000 kL/year, or 15 ML/year. This figure is likely to be an upper limit during high production periods.

Dust Suppression – Haul Roads

Dust suppression on haul roads would be achieved by watering the roads using a nominal 13 kL capacity water cart. Water cart use will vary with weather conditions. Watering would not be employed during wet weather and in all likelihood rarely in winter. Hot, dry summer days with high haulage volumes are likely to demand greatest use. During maximum use conditions (approximately 20 days per year) the cart may be emptied 8 times per day. For the remainder of the operating year (estimate 150 days), average water cart would be much less, use maybe 2 loads per day. Average annual usage is approximately 6 ML per year.

Process Water – Crushing and Screening Plant

Water is used in the crushing and screening plant for equipment cleaning and for dust suppression, primarily at conveyor transfer points. It is difficult to estimate the water demand for these operations as the particular equipment is yet to be chosen. For estimation purposes an average daily demand of 10 kL is adopted, equating to an estimated annual use of 2.5 ML for 250 days of operation.

Total

Base on the above estimates the estimated annual non-potable water demand is approximately 23.5 ML/year. This is expected to be an upper limit once the quarry is in full production.

6.7.7. Water Yield

Non-potable water would be supplied primarily from stormwater captured in on-site sediment basins. Annual catchment yields were estimated for the total area of the quarry footprint plus the processing area which total approximately 14.5 ha.

Potential catchment yields were estimated for dry, normal and wet years, using long term annual rainfall statistics from Denman (Bureau of Meteorology station) which is similar to the statistics for Sandy Hollow (Goulburn Drive) however slightly more conservative (less average rainfall), but still representative of the site. **Table 40** provides the climate statistic details for the 10, 50 and 90th percentile annual rainfall.

Catchment yields were estimated by multiplying catchment areas by rainfall depth by an annualised volumetric runoff coefficient (Cv). Long term volumetric runoff coefficients are estimated with reference to Landcom (2004) and also the regional runoff coefficient adopted by NSW Department of Water and Energy (DWE) when assessing harvestable rights for farm dams. From Table F2 in Landcom (2004), Cv ranges from 0.01 for small rain events on rapidly drained soils, to 0.79 for large rain events on impermeable soils. However, these values are runoff coefficients for short-term rain events and are significantly higher than occurs over longer average periods such as an entire year. By comparison, harvestable rights calculations for this area adopt an annual runoff coefficient of 10% (i.e. 10% of volumetric rainfall converts to runoff).

Within the quarry the volume of annual rainfall that runs off (Cv) is expected to be somewhere between 10% and 50%. A Cv of 0.25 is adopted as a ball-park figure for our analysis and is likely to be a conservative estimate. There is a high degree of uncertainty over the actual volumetric runoff coefficient and these calculations are indicative only, yet sufficient for the purpose of this analysis.

Table 41 presents the potential yields for dirty water capture within the quarry and processing areas, for the 10, 50 and 90th percentile annual rainfall years.

Table 40 Climate Statistics Use for Water Yield Estimates

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
10%ile	16.7	5.3	4.3	3.8	2.8	8	6.7	3.9	7.5	6.9	7.6	15	358
50%ile	59.8	47.8	36.6	31.4	26.5	31.5	29.6	27.1	31.8	39.7	50.4	56.9	591.9
90%ile	159.5	152.4	119.9	83.4	79	84.3	90.8	76.2	76.7	97.3	108.2	121.6	787.6

Table 41 Water Yield Estimates

Catchment Details	Quarry	Processing Area	Total
Total catchment Area (ha)	10.5	2.0	14.5
Annual Runoff Coefficient (Cv)	0.25	0.25	0.25
Percentile	Average Annual Yield (ML)		
10%ile rain year	9.4	1.8	11.2
50%ile rain year	15.5	3.0	18.5
90%ile rain year	20.7	3.9	24.6

6.7.8. Water Balance

A simple annual water balance was used to compare quarry water demands with the volume of water which could be realistically collected within the site, and is used to predict the security of supply and the magnitude of any water surplus, or deficit.

The predicted catchment yields may be greater than the effective yields due to factors like storage overflow when full, and seepage losses from poorly sealed storages. Additional losses may occur where there is net evaporation from the storage surface. In this water balance we have assumed that any dams would be well sealed and seepage losses would be negligible. We have also assumed that storages would be sufficiently large to ensure overflow losses are negligible. The effects of evaporation from the storage surfaces have not been evaluated.

Based on the simplistic water balance it is predicted that the total annual water demand for processing and site management of approximately 23.5 ML could be met by onsite water capture in a wet (90%ile) rain year providing the collection system is efficient and the dams are sufficiently large to minimise overflow losses. During normal and dry years there will be a water deficit. Additional water may need to be supplied from alternate sources. It is planned to amend the existing water license 20CA212769 so that water can be used on Lot 2 and to install a suitable pipeline within existing easement to deliver water to the quarry.

A more detailed water balance could be conducted later to help determine optimum sizes for the large storage dams, to ensure the quarry has sufficient security of supply to meet demands while also maximising fresh water discharges to downstream waters.

No groundwater pumping or interception is proposed to provide water supply for quarrying purposes.

6.7.9. Impact of Final Void

On completion of quarrying the open void would be rehabilitated to ensure a stable long term landform is achieved. This would include revegetation of appropriate areas. The void would continue to capture surface water that is incident on the void area only and upslope runoff would continue to be diverted around the quarry for stability control.

The void would be left with the floor in a condition that is free of any potentially contaminating material and conducive to infiltrating any surface water, resulting in the quarry becoming a groundwater recharge area. A shallow sump may be located at the lowest position in the quarry.

The quarry is unlikely to ever hold significant volumes of water due to the combined losses from infiltration and evaporation. It is not proposed to license any permanent water take within the quarry.

6.8. Groundwater

RCA Australia (RCA) undertook geotechnical investigations at the site in April 2012 and September 2014. The investigations included the rock coring drilling of eight bore holes and the installation and measuring of groundwater depths in four (4) piezometers established in BH5, BH6, BH7 and BH8.

Monitoring was carried out by manually dipping the water level and sampling in 4 boreholes (BH5, BH6, BH7 and BH8 fitted with stand pipe piezometers), during 3 site visits and by automatic water level monitoring in the period between the site visits. Site visits were undertaken during the months of January, May and July of 2015.

A detailed groundwater impact assessment has been prepared by RCA (2015) and is contained in Appendix N.

6.8.1. Overview of Baseline Groundwater Monitoring

Baseline groundwater monitoring was undertaken to ascertain and detail the following:

- Groundwater levels and response to climatic conditions;
- Groundwater gradient, velocity and flow direction;
- Groundwater quality and response to climatic conditions;
- Potential for groundwater interception by the proposed quarry; and
- Potential for impacts on groundwater quality and quantity.

The assessment comprised groundwater quality and groundwater level monitoring of piezometers in four (4) bores located on site. The bores were manually dipped by a hand held dip meter and purged. Groundwater samples were collected and sent to a NATA accredited laboratory and analysed for pH, electrical conductivity (EC), dissolved oxygen, total dissolved solids (TDS), major cations and anions, ammonia, nitrates + nitrites and metals (iron, copper, lead, zinc, cadmium, chromium, nickel, manganese, aluminium, arsenic and mercury).

Automatic loggers were installed to collect water level readings (located in BH5 and BH8) and barometric pressure readings (located in BH8). Groundwater bore licence applications for monitoring wells in BH5 to BH8 have been lodged with NOW.

6.8.2. Groundwater Levels

No groundwater was observed prior to rock coring water recirculation drilling techniques commencing in BH1 to BH4 which were drilled in April 2012. At the request of RCA the client dipped the boreholes in June 2013 to determine if there was any standing groundwater in the boreholes. No free water was encountered. These BHs had collapsed below the inspection depth. There were no visual or olfactory signs of contamination observed during the inspection.

The groundwater observations from the client borehole inspection are presented in **Table 42**.

Table 42 Groundwater observations from borehole inspections

BH No.	Surveyed Collar RL (m AHD)	BH drilled depth (m)	BH inspected to depth (m)	Comments
BH1	173.00	30	16	No free water encountered in all BHs. BH had collapsed below inspection depth.
BH2	181.90	30.1	25	
BH3	168.14	30	11	
BH4	177.84	27.15	20	

Groundwater levels in piezometers at BH5, BH6, BH7 and BH8 were measured on the 6 November 2014 and then for 8 months thereafter ending in July 2015, to track groundwater variability over this time. Measured groundwater levels from the 6th November 2014 along with borehole details are shown in **Table 43**.

Table 43 Measured groundwater levels, 6 November 2014

Monitoring well	RL of top of PVC pipe (m AHD)	Depth to bottom of bore from top of PVC pipe (m)	PVC pipe stickup above ground surface (m)	Groundwater surface depth from top of pipe (m)	RL of Groundwater surface (m AHD)
				6/11/14	
BH5	176.38	61.5	0.622	45.51	130.87
BH6	161.80	45.0	0.69	30.83	130.97
BH7	167.12	40.2	0.565	34.91	132.21
BH8	158.71	40.1	0.645	36.13	122.58

The Widden Brook Conglomerate overlies the Greigs Creek Coal Seam which is at the top of the Wollombi Coal Measures. As such, the notional quarry base is at the top of the coal seam.

Table 44 provides the water levels measurements for the baseline monitoring period between November 2014 and July 2015. The results demonstrate that there is minimal variation in measured groundwater depths. The greatest variation was observed in BH7 which varied from 132.21m AHD in November 2014 to 130.93m AHD in January and July 2015.

Table 44 Comparison of measured groundwater levels and top of Greigs Creek seam

Monitoring Piezometer Location	Groundwater surface level (m AHD)						Level of top of Greigs Creek seam (m AHD)	Minimum distance to GW from top of Greigs Creek seam (m)
	6/11/14	22/1/15	23/1/15	29/1/15	6/5/15	16/7/15		
							Notional base of quarry	
BH5	130.87	130.9	130.88	130.88	131.86	130.87	142.38	10.48
BH6	130.97	130.95	130.95	130.91	130.81	131.44	136.5	5.06
BH7	132.21 ¹	131.13	130.95	130.93	131.07	130.93	143.07	10.86
BH8	122.58	122.59	121.35 ²	122.52	122.41	122.55	129.48	6.89

[1] Highest water level during monitoring period

[2] lowest water level during the monitoring period

The hydrographs as measured from the data logger's in BH5 and BH8 are shown in **Appendix N**. The trends are similar to the manual water level readings with little change in water levels over the monitoring period except when water purging/sample pumping occurred at BH8. The piezometer in BH8 is sealed into low permeability strata so pumping resulted in drawdown which took a discernible period to recover. Conversely the piezometer in BH5 is sealed in relatively high permeable strata resulting in no discernible draw down on purging/ water sampling and rapid water level recovery. The hydrographs do not indicate a discernible trend between rainfall and groundwater depth/ level.

Appendix F of the Groundwater Impact Assessment (**Appendix N**) shows depth to groundwater hydrographs for each borehole compared with daily rainfall data from Baerami (The Old Dairy) station number 061423 (approximately 18kms south west of the site), which is the closest up to date available station on the BoM website. The comparison concludes that:

- The greatest variation in groundwater levels measured in any one monitoring piezometer was 1.28m.
- Groundwater levels at the site ranged from 121.35m AHD to 132.21m AHD.
- No discernible trend between rainfall and groundwater depth/level was observed.

6.8.3. Groundwater Contours

Groundwater flow directions were assessed from the groundwater surface contours (based on survey and groundwater depth at the four (4) groundwater monitoring piezometers). Groundwater at the site is interpreted to flow in a general westerly direction with flow along the north-east boundary in a general northerly direction, from the eastern boundary of the site towards the Wybong Creek in the west and its tributaries to north of the site.

With reference to the groundwater contour levels presented in the Groundwater Impact Assessment (**Appendix N**), the overall groundwater surface gradient between BH6 and BH8 is approximately 3.9%.

The results of Packer testing carried out, in the saturated zone below the groundwater table, during the geotechnical investigations for the project indicate values ranging from no take up to 140 Lugeons indicating permeability's ranging up to 10-5m/sec. The average of the Lugeon testing indicated a permeability of 3.6×10^{-6} m/sec.

Adopting the average permeability and the gradient between BH6 and BH8, the lower bound groundwater flow rate through the site is expected to be the order of 4.5m per year with an upper bound an order of magnitude higher.

Figure 16 shows a conceptual hydrogeological setting for the Project.

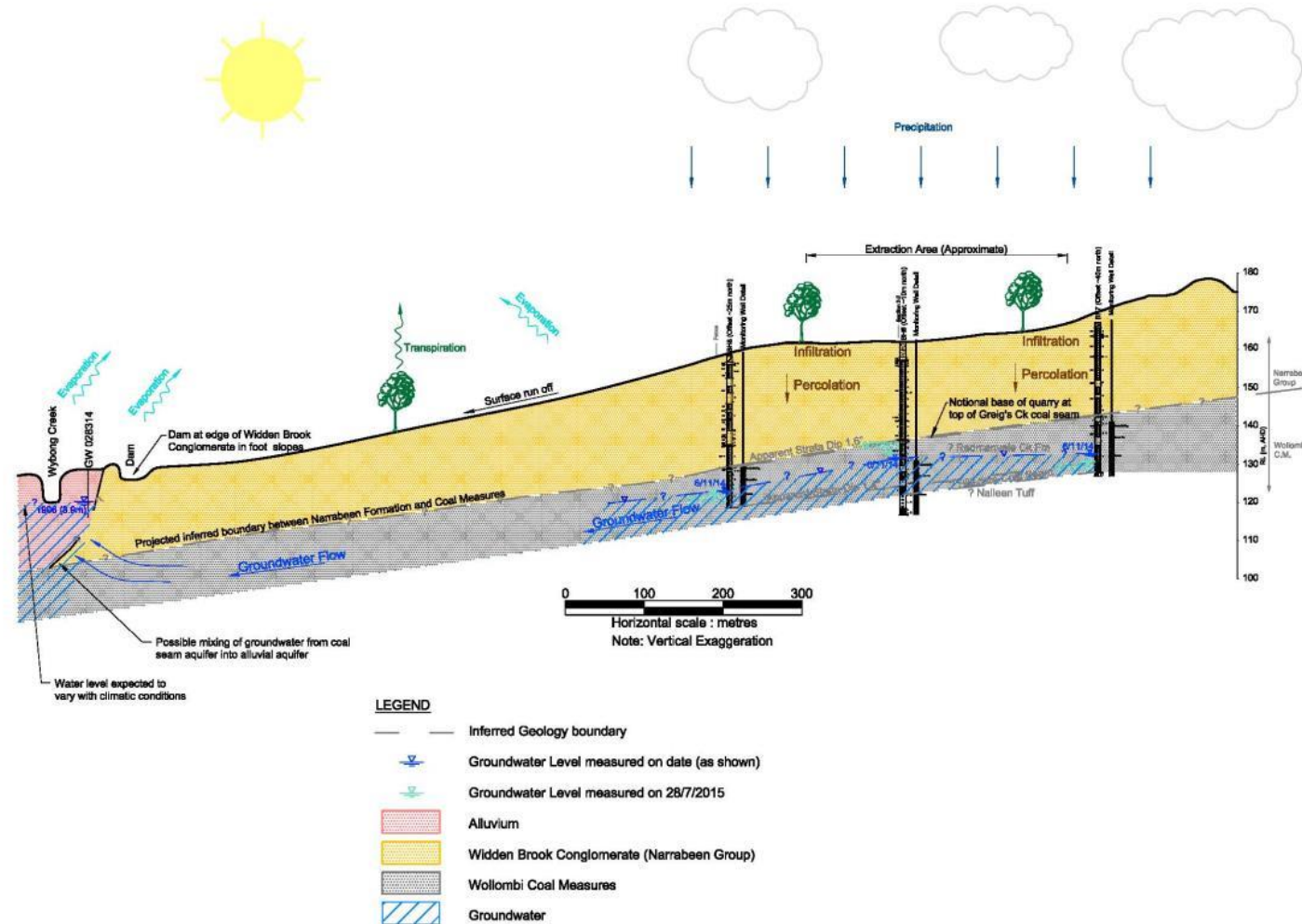


Figure 16 Conceptual hydrogeological setting

6.8.4. Groundwater Quality

The results from groundwater sampling in January 2015 and May 2015 are presented in **Table 45** and **Table 46** indicated the following conditions, in summary:

Field Testing

- The pH readings in all bores ranged from 6.2 to 7.09 pH units, indicating slightly acidic to relatively neutral pH conditions.
- The field testing conductivity results indicate that the TDS in all bores is above 500mg/L and in all except one location above 1500mg/L.

Table 45 In-situ parameters measured January 2015

Location	Average In Situ Value ¹					
	pH	Conductivity (mS/cm)	Turbidity	Dissolved O ₂ (mg/L) ²	Temperature (°C)	Salinity (%)
BH5	6.43	8.01	107	2.55	21.4	0.43
BH6	6.27	4.06	18	0.54	21.3	0.20
BH7	6.81	0.89	116	0.25	23.3	0.03
BH8	6.69	2.67	407	0.37	20.9	0.13

¹ Average in situ value represents the average of the last three (3) measured values.

² It was noted that during sampling the Horiba metre (ENV-1037) used for in situ parameter measurements had a split membrane. The membrane is used to measure dissolved oxygen.

Table 46 In-situ parameters measured May 2015

Location	Average In Situ Value ¹					
	pH	Conductivity (mS/cm)	Turbidity	Dissolved O ₂ (mg/L) ²	Temperature (°C)	Salinity (%)
BH5	6.27	8.38	2	1.56	21.2	0.46
BH6	6.20	4.35	6	1.67	21.7	0.22
BH7	6.30	3.52	47	2.61	23.7	0.17
BH8	7.09	3.20	999	5.51	18.5	0.15

¹ Average in situ value represents the average of the last three (3) measured values.

² It was noted that during sampling the Horiba metre (ENV-1037) used for in situ parameter measurements had a split membrane. The membrane is used to measure dissolved oxygen.

Laboratory Testing

- The major anion in all bores was chloride followed by bicarbonate and sulfate. The major cation in all bores was sodium followed by magnesium, calcium and potassium.
- Cation and anion concentrations were the lowest in BH7 in January 2015 (19.2 meq/L and 19.3 meq/L) and significantly greater in BH5 (98.8/96.7 meq/L and 106/109 meq/L in January/May 2015), with concentrations between these values in BH6 and BH8.
- The pH readings in all bores ranged from 6.2 to 7.09 pH units, indicating slightly acidic to relatively neutral pH conditions.
- Ammonia concentrations were detected below the ANZECC criteria (0.9 mg/L) in all bores.
- Detectable concentrations (below the guideline level) of nitrate + nitrite and phosphorus were identified in one bore (BH8 in January 2015).
- Total dissolved solids varied from 1022mg/L to 5639mg/l (ie, greater than 500mg/L) and only one of the test results for TDS in BH7 (ref summary in Appendix E) having a TDS of less than 1500mg/L.

- Laboratory total dissolved solids varied from 1022mg/L to 5639mg/L (ie. greater than 500mg/L) with only one of the test results having a TDS of less than 1500mg/L. Based on the TDS the water would be regarded as brackish.
- The major anion in all bores was chloride followed by bicarbonate and sulfate. The major cation in all bores was sodium followed by magnesium, calcium and potassium.
- Owing to the brackish nature, the groundwater would not be considered potable without treatment and therefore the Australian drinking water guidelines are considered not to be applicable as Groundwater Investigation Levels (GILs). The gradient on the groundwater surface as measured in investigation monitoring piezometers (see **Figure 16**) indicates that the receiving water is Wybong Creek and as such the ANZECC 2000, 95% fresh water criteria are considered to be the applicable GILs for the assessment of risk to aquatic ecosystems. It is noted however, that it is considered that groundwater concentrations would not be representative of direct contact in Wybong Creek and may not be representative of extracted groundwater off the site.
- Adopting the ANZECC 2000, 95% Protection Level for fresh water for use as the applicable GILs the water on site chemical testing reported elevated concentrations of arsenic, iron nickel and zinc (see **Table 47**). The elevated levels are thought to be due to natural causes.

Table 47 Groundwater metals concentrations above the relevant criteria

Sample Identification	Analyte	Criteria ¹ (mg/L)	Concentration (mg/L) Jan / May 2015
BH5	Iron	0.3	11.3 / 0.89
	Zinc	0.008	0.021 / -
BH6	Iron	0.3	4.32 / 3.5
	Zinc	0.008	0.025 / 0.021
BH7	Iron	0.3	1.52 / 2.65
	Nickel	0.011	0.022 / 0.012
	Zinc	0.008	0.047 / 0.034
BH8	Arsenic	0.013	0.04 / 0.023
	Nickel	0.011	0.051 / 1
	Zinc	0.008	0.071 / 0.093

¹ ANZECC 2000 95% Protection Level for fresh water.

The NOW Groundwater Interference Policy (DPI 2012b) divides groundwater into categories of highly productive and less productive groundwater sources based on the yield and TDS. Groundwater for the Project would fall into the category of a less productive groundwater source due to the aquifer having the following characteristics:

- A TDS of greater than 1500mg/L; and
- an expected water yield rate of less than 5L/sec.

6.8.5. Potential Impacts

The notional base of the quarry (the top of the Greigs Creek seam) is more than 5m above the monitored groundwater levels. The base of the proposed quarry development is:

- above the geological unit (Wollombi Coal Measures) which is acting as an aquifer containing groundwater beneath the site;
- above the surface of the groundwater within the aquifer; and

- above the level of the likely fluctuation of the groundwater surface.

With reference to the groundwater monitoring results, it is considered unlikely that quarrying to the top of the Greigs Creek Coal Seam will penetrate the groundwater surface at the site. Based on this, the excavation of the quarry is expected not to intersect the coal seam aquifer or groundwater at the site.

In regard to the potential impacts to groundwater quality during quarrying operations this would be guarded against by conducting the operations in accordance with a suitably drafted Operational Environmental Management Plan which would include the following requirements to protect groundwater:

- Containment of any chemicals and fuels in lined bunded areas that are designed to safely accommodate the volume of the stored material;
- Containment of sewerage water and treatment out of the quarry in an approved manner; and
- Containment of truck wash water and processing water such that they can be processed and re-used.

The depth of the quarry will increase with time generally in accordance with the approved quarry plan. This will allow progressive monitoring of groundwater levels with time.

If groundwater levels are found to rise with time the base level of the quarry would be adjusted to maintain an appropriate buffer between the base of the quarry and the groundwater surface. The trigger level for review would be a change in water level of 2m from the previous reading or the base of the quarry being within 5m of the top of the groundwater surface.

The ecological assessment by Umwelt determined there is one terrestrial vegetation community within the wider study area that is expected to be dependent on shallow groundwater resources during periods of reduced surface water flow. This community is the river oak woodland along the banks of Wybong Creek. The proposed quarry is located further than 900 metres from this groundwater dependent terrestrial vegetation community. The Umwelt report indicated there would not be an impact on the GDE.

It is understood that it is proposed to finish the quarry as a closed void where surface water would be diverted around the quarry and rainfall over the plan area of the void would be collected in the void.

Similarly it is expected that rain falling on the quarry plan area will (less evaporation/transpiration) infiltrate the base of the quarry. As such, the quarry is not expected to pond water. A water balance in **Section 6.7** provides a detailed justification why the quarry is expected to be a dry quarry.

A full summary addressing the SEARs and issues raised by NOW are contained in Table 8 of the Groundwater Impact Assessment in **Appendix N**.

Overall the expected impacts on groundwater as a result of the Project are negligible.

6.8.6. Groundwater Monitoring

Groundwater monitoring is proposed to observe groundwater quality and level throughout the life of the quarry and to ensure that groundwater is not being impacted by the project. A detailed groundwater monitoring plan including contingency measures in the event of impacts being observed, will be provided in the Operational Environmental Management Plan for the quarry.

It is proposed to monitor the groundwater level and quality in three monitoring wells in BH5, BH7 and BH8.

The groundwater would be monitored bi-annually for the following:

- Level of the groundwater surface.
- Groundwater quality (pH, EC, TPH and PAH)

After two years of operations the monitoring program would be reviewed, with a view to reducing the monitoring frequency to annually if this can be justified through stability of historical results and absence of any observed impacts.

The testing results would be tabulated and reported in a working document with comparison to previous monitoring results.

6.8.7. Mitigation Measures

Mitigation and management measures to ensure protection of groundwater are provided in **Table 48**.

Table 48 Groundwater Mitigation Measures

Measure No.	Mitigation measure
GW1	<p>A groundwater management plan shall be prepared and included as part of the Operational Environmental Management Plan. This will include details for required protection measures including::</p> <ul style="list-style-type: none"> • Containment of any chemicals and fuels in lined bunded areas that are designed to safely accommodate the volume of the stored material; • Onsite sewage management to be undertaken in a manner that does not impact groundwater; and • Containment of truck wash water and processing water such that they can be processed and re-used and not contaminate groundwater. • Groundwater monitoring plan
GW2	<p>Monitor groundwater levels and quality in BH5, BH7 and BH8 twice per year. Results would be tabulated and reported in a working document with comparison to previous monitoring results. Groundwater would be tested for pH, Conductivity, Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAH).</p>

6.9. Soils and Geology

6.9.1. Geology

Reference to NSW Geological Survey (NSW GS) geo-referenced 1:100,000 Hunter Coalfield Geology Google overlay indicates that the Project traverses the geological boundary between the Wollombi Coal Measures Glen Gallic Sub-group and the overlying Narrabeen Group Widden Brook Conglomerate. Based on NSW GS mapping it appears borehole BH1 is located within the mapped extent of the Glen Gallic Sub-group and boreholes BH2 to BH4 are located within the mapped extent of the overlying Widden Brook Conglomerate.

A report by RCA Australia (RCA, 2014) comprising a preliminary resource estimate is attached at **Appendix E** and contains detailed information on the observed geology at the site. Bore hole cores were taken to a depth of between 30 and 45 metres from four locations dispersed over the Project area in April 2012 (RC 2012). Additional cored boreholes BH5 through BH8 were collected over a period in September 2014 by Terratest Drilling within a targeted area on Lot 2. These were drilled vertically to depths ranging from 27.15 m to 30.1 m, and borelogs were prepared by Hunter Geotechnics.

The rock core recovered from boreholes appears to be consistent with the geology shown on the NSW GS 1: 100,000 Hunter Coalfield Geology sheet. The nearest cross-section on the NSW GS 1: 100,000 Hunter Coalfield Geology sheet indicates the base of the Wollombi Coal Measures dips in a westerly direction at approximately 10° . Reference to NSW DMR notes for the Hunter Coalfield indicates the Widden Brook Conglomerate directly overlies the Greigs Creek Coal Seam (the uppermost coal).

Additional fieldwork was carried out on 19 June 2014, and involved the excavation and sampling of three (3) test pits using a dozer, to depths ranging from 1.1 to 3.5m.

6.9.2. Soil Landscape

Soil Landscapes of the Singleton 1:250,000 Sheet (Kovac & Laurie, 1991) indicates that the Project Area and much of the Dolwende property contains the Sandy Hollow Soil Landscape. The rocky escarpment south of the proposed quarry is described as Lees Pinch Soil Landscape. The alluvial flats adjacent to Wybong Creek are described as Wollombi Soil Landscape.

The Sandy Hollow Soil Landscape covers undulating rises and slopes within the Goulburn Valley on sandstone, gravel and shale parent material of the Narrabeen Group. The main soils are red and yellow Solodic Soils on the lower slopes. Red Earths occur midslope directly adjacent to sandstone benches with Siliceous Sands. Alluvial soils occur along major drainage lines. Soil salinity, high erodibility and poor drainage are constraints that can occur across this landscape.

6.9.3. Site Soils

The soils of the proposed gravel extraction area are solodic soils, sedimentary deposits, gravelly textured. Top soils are moderately to strongly acidic with the sub soil being slightly acidic to neutral in pH. The soils are very deficient in major and minor plant nutrients, have low water holding capacity, are imperfectly drained, are loose to hard setting and moderately permeable. The topsoil is weakly structured gravelly loam textured overlaying a reddish, yellow or brown medium clay subsoil.

They have a moderate to high erosion hazard and propensity to structural breakdown once disturbed. They are a soil with medium to low shrink swell characteristics.

A description of the topsoil and subsoils from the borelogs prepared for boreholes BH1 to BH8 is provided in **Table 49**. Samples of topsoil and subsoil from boreholes BH5 – BH8 were collected by RCA and sent for analysis at the Department of Lands Scone research Centre soil testing laboratory. The analysis included a variety of physical and chemical characteristics. The laboratory data is provided in full in the RCA (2015) Geotechnical Investigation report (**Appendix F**).

Table 49 Soil Sample Descriptions

Sample	Description	Depth
BH1	Sandy Silt, low plasticity, grey-brown, fine to coarse grained sand, w/ gravel, trace of clay	0-40cm
BH1	Silty Sandy GRAVEL, fine to medium, brown-red-grey, fine to coarse grained sand	40-250cm
BH2	Sandy SILT, grey-brown, fine to coarse grained sand, with gravel, trace of clay	0-40cm
BH2	Silty Sandy GRAVEL, fine to medium, brown-grey, fine to coarse grained sand	40-475cm
BH3	Sandy SILT, low plasticity, grey-brown, fine to coarse grained sand, with some gravel	0-40cm
BH3	Silty Sandy GRAVEL, fine to medium, brown-red-grey, fine to coarse grained sand	40-155cm
BH4	Sandy SILT, low plasticity, grey-brown, fine to coarse grained sand, with gravel, trace of clay	0-40 cm
BH4	Silty Sandy GRAVEL, fine to medium, brown-grey, fine to coarse grained sand	40-260cm
BH5	TOPSOIL, Gravelly Silty SAND, fine to coarse grained, brown, with sub rounded to rounded gravel, up to 40mm, with abundant roots.	0-50 cm
BH5	Sandy GRAVEL, up to 50mm, pale yellow-orange, sub rounded to rounded, with some clay	50-150cm
BH5	Gravelly SAND, fine to medium grained, pale yellow, red, white and yellow-orange sub rounded to rounded gravel, 2-15mm	150-250cm
BH5	Pebbly SANDSTONE/CONGLOMERATE, sub rounded to rounded gravel of various colours in a pale grey matrix	250-650cm
BH6	Sandy GRAVEL/Gravelly SAND, fine to coarse grained sand, brown to dark brown, sub rounded-rounded gravel, up to 20mm	0-70 cm
BH6	Gravelly SAND, fine to coarse grained, pale yellow brown, sub rounded-rounded gravel, up to 20mm	70-100cm
BH6	Gravelly SAND, fine to coarse grained, pale brown, sub rounded-rounded gravel, up to 5mm	100-180cm
BH6	SAND, fine to coarse grained, pale brown, trace of gravel	180-380cm
BH7	Sandy GRAVEL, up to 30mm, orange-red-brown, sub rounded-rounded	0-80 cm
BH7	Gravelly SAND, fine to coarse grained, orange-brown	80-140cm
BH8	TOPSOIL, Silty SAND, fine to medium grained, dark brown-black, with sub rounded-rounded gravel	0-30 cm
BH8	Clayey SAND/Clayey GRAVEL, up to 10mm, pale brown, sub rounded-rounded, medium to coarse grained sand	30-200cm

6.9.4. Soil Erodibility (RUSLE K-Factor)

An understanding of soil erodibility is important in planning for development, assessing the erosion hazard and designing for effective erosion and sediment control.

Laboratory data from the Soil Conservation Service (**Appendix F**) is summarised in **Table 50** and was used to calculate soil erodibility (K-factor in the Revised Universal Soil Loss Equation) according to the methods of Rosewell (1993) and using the SOLOSS program. The soil erodibility is moderate.

Table 50 Soils Particle Size Data

Sample Id	Depth	Laboratory Results						Interpreted Data		
		particle size analysis (%)						WSP%	Dispersible Soils (Y/N)	K-factor
clay	silt	f sand	c sand	gravel	D%					
BH5	0.1-0.5 m	4	5	15	46	30	75	4.9	N	0.026
BH6	0.1-0.3 m	4	12	25	40	19	75	7.5	N	0.042
BH6	1.0-1.3 m	13	10	20	42	15	75	13.5	Y	0.031
BH7	0.1-0.3 m	2	4	9	23	62	42	1.7	N	0.030
BH7	0.9-1.0 m	10	9	16	51	14	65	9.4	N	0.027
BH8	0.1-0.3 m	11	10	17	34	28	68	10.9	Y	0.027
BH8	0.7-1.0 m	10	11	14	38	27	83	12.9	Y	0.031

1. D% = dispersion percentage; WSP% = percentage of whole soil dispersible (10 or greater = D Type Soil); K-factor = soil erodibility rating (refer Blue Book)

6.9.5. Estimated Annual Soil Loss (RUSLE)

The Blue Book outlines a method for estimating erosion hazard using the Revised Universal Soil Loss Equation (RUSLE). Erosion hazard can be estimated by determining RUSLE and comparing with guideline values published in Figure 4.6 in the Blue Book.

Table 51 summarises the Revised Universal Soil Loss Equation (RUSLE) factors.

Table 51 Revised Universal Soil Loss Equation Factors

Factor	Value	Description
R-factor	1500	Rainfall erosivity: related to average rainfall energy and intensity. Data taken from R-factor maps published in Annex B of the Blue Book
K-factor	0.042	Soil erodibility: conservative value calculated from soils data including texture, structure, organic matter content and permeability (refer Rosewell 1993)
LS-factor	2.05	Slope length/gradient factor: describes the combined effect of slope length and gradient on soil loss. Adopted slope length = 80m and slope gradient = 8%. Value taken from table A1 in the Blue Book
P-factor	1.3	Practice-factor: related to site management practices and surface condition, and their relationship to runoff generation. A factor of 1.3 is standard on construction sites.
C-factor	1.0	Cover factor: describes the effect of surface cover in reducing exposure of soils to erosion. A nominal value of 1.0 is adopted for construction sites where soils are bare and compacted.

Factor	Value	Description
Annual estimated soil loss	168	Soil loss (in T/ha/yr) calculated by RUSLE equation, as $A = R \times K \times LS \times P \times C$
Soil Loss Class	2 (Low)	The Blue Book describes seven soil loss classes ranging from 1 (very low, 0-150 T/ha/yr) to 7 (extremely high, >1500 T/ha/yr). The Blue Book also prescribes management requirements dependent on soil loss class.

The annual estimated soil loss for the Project footprint is estimated as 168 tonnes per hectare. Using soil particle size analysis and Dispersion Percentage provided by the SCS, the soil type has been determined to be Type D (dispersible). On-site sediment basins would be designed and managed for Type D soils. Several nominal basin sizes have been calculated based on hectare size, as shown in **Table 38**.

6.9.6. Soil Sodicty

Laboratory data from the Soil Conservation Service summarised in **Table 52** shows the range of cations and organic content percentage. Soils are strongly sodic and low in organic matter.

Table 52 Soil Sodicty and CEC

		Laboratory Results							Interpreted Data		
		meq/100g							mg/kg	%	Sodicty Rating
Sample Id	Depth	CEC	Na	K	Ca	Mg	Al	OC (%)	Avail P	ESP	
BH5	0.1-0.5 m	5.4	0.4	0.3	0.8	1.9	0.9	0.57	2	7.4	Sodict
BH6	0.1-0.3 m	5.1	0.6	0.3	0.8	1.7	0.9	0.32	2	11.8	Strongly Sodict
BH6	1.0-1.3 m	5.7	2	0.9	0.5	4.2	1.2	0.08	<1	35.1	Strongly Sodict
BH7	0.1-0.3 m	2.9	0.4	0.3	1.1	1.8	1.8	0.79	3	13.8	Strongly Sodict
BH7	0.9-1.0 m	4.8	0.5	0.4	0.3	2.5	1.6	0.13	2	10.4	Strongly Sodict
BH8	0.1-0.3 m	8.7	1.4	0.5	2.8	3.9	1.6	1.62	1	16.1	Strongly Sodict
BH8	0.7-1.0 m	7	1.1	0.5	1.1	4	1.5	0.26	1	15.7	Strongly Sodict

1. ESP = Exchangeable Sodium Percentage; OC = organic content

6.9.7. Potential Impacts

The Project could have potential impacts on the soils and geology of the project site including:

- Soil disturbance would occur during construction and operation of the quarry that could lead to soil erosion and sedimentation from sediment laden runoff. Types of disturbance activities and potential impacts include:
 - Disturbance to native soils during stripping;
 - Stockpiling of topsoil and overburden;
 - Construction and operation of the haul road; and
 - Stockpiling of processed quarry materials.
- Exposed soils would be prone to surface crusting, have low infiltration and hydraulic conductivity and be susceptible to severe erosion;
- Decreased water quality as a result of sediment laden runoff.

- Exposure of sodic soils leading to accelerated erosion; and
- Potential disturbance of historical land contamination and future contamination through fuel storage and hydrocarbon spills.

These risks are not severe and can be mitigated through implementation of a suite of conventional soil and water management controls. The site does not present any unusual or difficult to manage constraints.

6.9.8. Mitigation Measures

Mitigation measures contained in the air quality chapter (**Section 6.3.6**) and surface water chapter (**Section 6.6.14**) of this EIS would address the potential impacts related to soils and geology.

6.10. Agricultural Assessment

Ross Watson Agriculture P/L was engaged to provide an initial agricultural appraisal of the site and assess the potential impacts of the proposed quarry on agricultural land and the environment. The agricultural assessment report (Ross Watson, 2015) is provided in **Appendix D**.

6.10.1. Agricultural Land Capability

The lands within the approximately 160 ha of the Dolwendee property were appraised and classified according to the Agricultural Land capability class system developed by NSW Agriculture. As shown in **Table 53** and **Figure 17** the major agricultural land classes on the site of the proposed gravel quarry is considered to meet the guidelines of Class 4 and 5 agricultural land, which have a low overall agricultural production potential.

The area assessed is estimated to be 12% Class 3, 56% Class 4 and 32% Class 5 Agricultural Land. Approximately 88% of the property meets the guidelines of low productivity Class 4 and 5 Agricultural Land. No prime (Class 1 and 2) agricultural land is contained on the Dolwendee property.

The area proposed for gravel extraction covers an area of approximately 10.7 hectares. An estimated 9 ha is Class 4 Agricultural Land and 1.7 ha is Class 5 Non-Agricultural land.

6.10.2. Existing agricultural resources

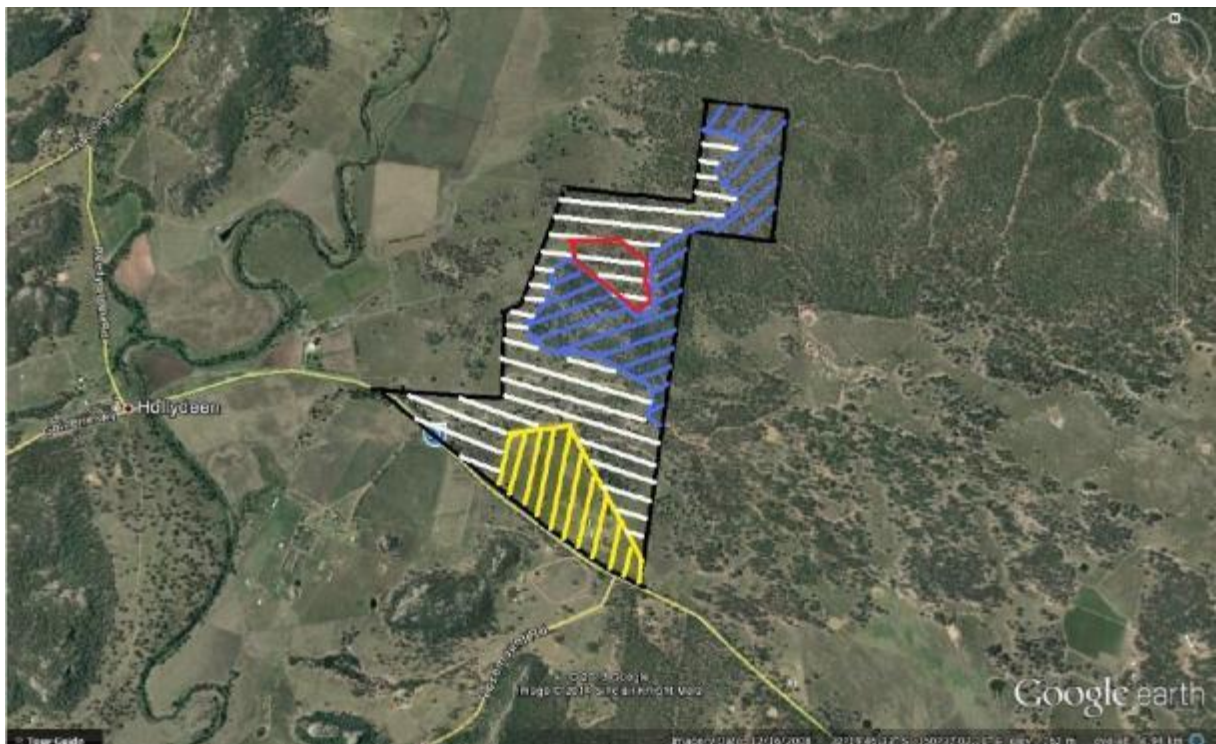
The soils of the proposed gravel extraction area are of low agricultural value (see **Figure 17**). They are solodic soils /sedimentary deposits, gravelly textured. Top soils are moderately to strongly acidic with the sub soil being slightly acidic to neutral in pH. The soils are very deficient in major and minor plant nutrients, have low water holding capacity and are imperfectly drained, loose to hard setting and moderately permeable.

The topsoil is weakly structured gravelly loam textured overlaying a reddish, yellow or brown medium clay subsoil. They have a moderate to high erosion hazard and propensity to structural breakdown once disturbed. They are a soil with medium to low shrink swell characteristics.

Soils with these features have limited agricultural value.

Table 53 Agricultural Land Capability

Agricultural Class	Land Description	Estimated Area (Hectares)	% of Dolwende property
Class 1	Arable land suited to continuous cultivation for uses such as intensive horticulture and field crops. Constraints to sustained high levels of production are absent or minor	0	0
Class 2	Arable land suited to regular cultivation for such as intensive horticulture and field crops. Constraints to sustained levels of production are minor to moderate.	0	0
Class 3	Land suited to occasional cropping but not continuous cropping. Best sown to perennial sub-tropical pastures. Production risks managed through a pasture phase, conservation tillage and or no till farming. Constraints to sustained levels of production are moderate	20	12
Class 4	Land suited to grazing but not cultivation. Agriculture is based on native pastures and or improved pastures established using minimum tillage techniques. Overall level of production is comparatively low due to major environmental constraints.	91	56
Class 5	Land not suited to agriculture or only light grazing. Agricultural production, if any is low due to major environmental constraints	52	32



Key: Quarry Footprint – Red; Class 3 – Yellow; Class 4 – White; Class 5 – Blue.

Figure 17 Agricultural Land Classes

6.10.3. Impact assessment

The proposed gravel extraction activity will not directly involve or impact on any prime or good agricultural land (i.e. Class 1, 2 or 3 Agricultural Land), which may be considered for equine or viticultural usage.

This area of the proposed gravel quarry has a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district.

An equine establishment is located approximately 1.0 km in a south westerly direction from the proposed gravel quarry. There are no perceived direct impacts on this equine operation. Further consultation with these nearby landholders would be undertaken to gain an appreciation of their level of concerns, if any are raised.

It is expected that any impacts could be minimised and managed to prevent adverse impacts on surrounding activities or land holders.

6.11. Aboriginal Cultural Heritage

6.11.1. Overview

McCardle Cultural Heritage Pty Ltd (MCH) prepared an Aboriginal Heritage Impact Assessment (MCH, 2015) for the Project. The assessment was undertaken in order to address the SEARs. The assessment is contained in **Appendix O** and summarised below.

McCardle Cultural Heritage Pty Ltd (MCH) prepared an assessment of Aboriginal heritage issues associated with the Project. The purpose of the assessment was to identify areas of indigenous cultural heritage value, to determine possible impacts on any indigenous cultural heritage identified (including potential subsurface evidence) and to develop management recommendations where appropriate. The assessment employed a regional approach, taking into consideration both the landscape of the study area (landforms, water resources, soils, geology etc.) and the regional archaeological patterning identified by past studies.

MCH's assessment has been completed in accordance with the applicable legislative framework, including the NPW Act, and best practice guidelines for survey reporting. As outlined in Section 5.2, it has also been completed in consultation with the local Aboriginal community and following the four stage process required under the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) (ACHCR).

The following tasks were undertaken as part of the assessment:

- A review of relevant statutory registers and inventories for indigenous cultural heritage including the OEH;
- Aboriginal Heritage Information Management System (AHIMS) for known archaeological sites, the State Heritage Register, the Australian Heritage Database (includes data from the World Heritage List UNESCO, National Heritage List, Commonwealth Heritage List, Register of the National Estate) and the Muswellbrook Local Environmental Plan;
- A review of local environmental information (topographic, geological, soil, geomorphological and vegetation descriptions) to determine the likelihood of archaeological sites and specific site types, prior and existing land uses and site disturbance that may affect site integrity;
- A review of previous cultural heritage investigations to determine the extent of archaeological investigations in the area and any archaeological patterns;
- The development of a predictive archaeological statement based on the data searches and literature review;
- Identification of human and natural impacts in relation to the known and any new archaeological sites and/or archaeological potential of the study area;

- Consultation with the Aboriginal stakeholders as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010);
- A site inspection with the participation of the registered Aboriginal stakeholders; and
- The development of mitigation and conservation measures in consultation with the registered Aboriginal stakeholders.

6.11.2. Existing Environment

The assessment found that whilst the regional environment provided resources, including raw materials, fauna, flora and water, that would have allowed for sustainable occupation of the area, this was not the case in the investigation area and immediate surrounds. Within the project area, the landforms and distance from reliable water sources and the associated resources indicate that the project area would not have been suitable for camping. Rather, areas along Wybong Creek and more so along the Goulburn River (over 1km away) would have been favoured for occupation.

In relation to modern alterations to the landscape, the use of the majority of the study area for agricultural purposes, clearing, grazing, fencing, tracks, dams and naturally occurring severe sheet wash was found to have had high impacts upon the landscape and associated archaeological record. Vegetation cover across the study area consisted of grasses with scattered areas of trees which effected visibility. However, effective coverage for investigation area illustrated that overall effective coverage was approximately 35%.

The predictive model suggested that within the investigation area, it was possible that isolated finds and/or very small density artefacts scatters may be located and associated with hunting and/or gathering and/or travel. The environmental context considered suitable for occupation, including close proximity to reliable water and associated resources and elevated landforms overlooking such water sources were absent from the study area.

Aboriginal Heritage Information Management System

A search of OEH's Aboriginal Heritage Information Management System (AHIMS) was undertaken by MCH on the 14 December 2014. The search identified 101 previously recorded Aboriginal sites within five kilometres of the study area. These include 96 artefacts (AFT), 2 shell (SHL), 1 scarred/carved tree (TRE), 1 artefact/Potential Archaeological Deposit (AFT/PAD) and 1 artefact/shell (AFT/SHL). None of these sites are within the Project Area.

MCH advised that whilst the regional environment provided resources, including raw materials, fauna, flora and water, that would have allowed for sustainable occupation of the area, this was not the case in the investigation area and immediate surrounds. Within the project area, the landforms and distance from reliable water sources and the associated resources indicate that the project area would not have been suitable for camping.

In addition, MCH confirmed that the investigation area had been subject to extensive land uses and erosion resulting in a highly disturbed landscape that would have also disturbed any sites. The limited number of sites present, disturbances encountered, its distance from water and resources supports the hypothesis that the investigation area was utilised at a low frequency and density indicative of transitory movement through the landscape.

Significance Assessment

In order to develop appropriate heritage management outcomes, it is necessary for the significance of Aboriginal sites or areas of archaeological sensitivity to be assessed. Aboriginal heritage sites can have a number of values which make them significant. Four values for identification and assessment of significance have been outlined in the *Burra Charter* (Australian National Committee of the International Council on Monuments and Sites (Australia ICOMOS) 1999) and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). In the

Burra Charter, cultural significance means the aesthetic, historic, scientific or social value for past, present or future generations.

The *NSW NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit* (1997) emphasises two realms of significance assessment, Aboriginal cultural significance and archaeological (scientific) significance. These two realms were taken into consideration in the assessment of significance.

Aboriginal Cultural Significance

As per the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010), MCH followed the four stages of consultation which included the notification of project proposal and registration of interest, presentation of information about the Project, gathering information about cultural significance and a survey. All registered Aboriginal Parties, as presented in **Table 54**, were invited to participate in the cultural significance assessment. The criteria adopted in the assessment of significance are presented in **Table 55**.

Table 54 List of Aboriginal Stakeholders

Stakeholder	Contact
Aboriginal Native Title Elders Consultants	Margaret Matthews
Hunter Valley Cultural Consultants	Christine Archibald
Upper Hunter Heritage Consultants	Darrel Matthews
Giwiirr Consultants	Rodney Matthews
Lower Hunter Wonnarua Cultural Services	Tom Miller
Hunter Valley Aboriginal Corporation	Rhonda Griffiths
Tocomwall	Scott Franks
Gomeroid Dreaming	Alfred Priestly
Gomeroid Enterprises	Anthony Munro
JLC Cultural Services	Jenny-Lee Chambers
Ungooroo Aboriginal Corporation	Taasha Layer

The Aboriginal stakeholders or stakeholder representatives involved in the investigation did not identify any sites of traditional cultural significance (such as mythological sites). In addition, the registered Aboriginal stakeholders did not disclose any specific knowledge of other cultural values or places. However, MCH noted that it is possible that traditional or historical Aboriginal values or associations may exist but were not divulged by the persons consulted, although this potential is assessed as low by MCH.

Archaeological (Scientific) Significance

Scientific significance is assessed according to the contents of a site, state of preservation, integrity of deposits, representativeness/rarity of the site type, and potential to answer research questions on past human behaviour (NPWS 1997).

Scientific significance of the identified sites was assessed by MCH in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and the criteria listed in **Table 55**. Scientific significance refers to the importance of a landscape, area, place or object due to its rarity, representativeness and the extent to which it may contribute to further understanding and information.

Table 55 Adopted scientific cultural significance criteria for Aboriginal heritage sites

Criteria	Description
Research potential	Research potential refers to the potential for information gained from further investigations of the evidence to be used in answering current or future research questions. Levels for defining research potential are High, Medium or Low.
Representativeness and rarity	Representativeness and rarity are assessed at a local, regional and national level. The more unique or rare the evidence is, the greater its value as being representative within a regional context
Nature of the evidence	The nature of the evidence is related to representativeness and research potential.
Integrity	The state of preservation and disturbances of the evidence (integrity) is also related to representativeness and research potential.

Site Survey Results

MCH conducted a walkover site survey of the project Area. The survey areas were surveyed on foot by the archaeologist and registered Aboriginal stakeholder representatives in accordance with the proposed methodology provided to the stakeholders for review and approved. The survey included transects at approximately 10 metres apart and focused on areas of high ground surface visibility and exposures (erosional features, gully, tracks, cleared areas).

Five new sites were identified from the site survey. Four of these were isolated stone artefacts with one artefact scatter. **Table 56** presents the significance assessment for the sites identified. Further detailed information on the site survey and results is contained in **Appendix O**.

It is noted that four of the Aboriginal Sites (DQ/2 to DQ/5) are within the Project Area and are expected to be impacted by the works. Site DQ/1 is outside the project footprint and within the road reserve of the Golden Highway. This Site would only be impacted if new roadworks were to occur in that area.

Table 56 Scientific significance assessment

Site	Site Type	Representativeness	Integrity	Research Potential	Scientific Significance
DQ/1	isolated	well represented	poor	no	low
DQ/2	artefact scatter	well represented	poor	no	low
DQ/3	isolated	well represented	poor	no	low
DQ/4	isolated	well represented	poor	no	low
DQ/5	isolated	well represented	poor	no	low

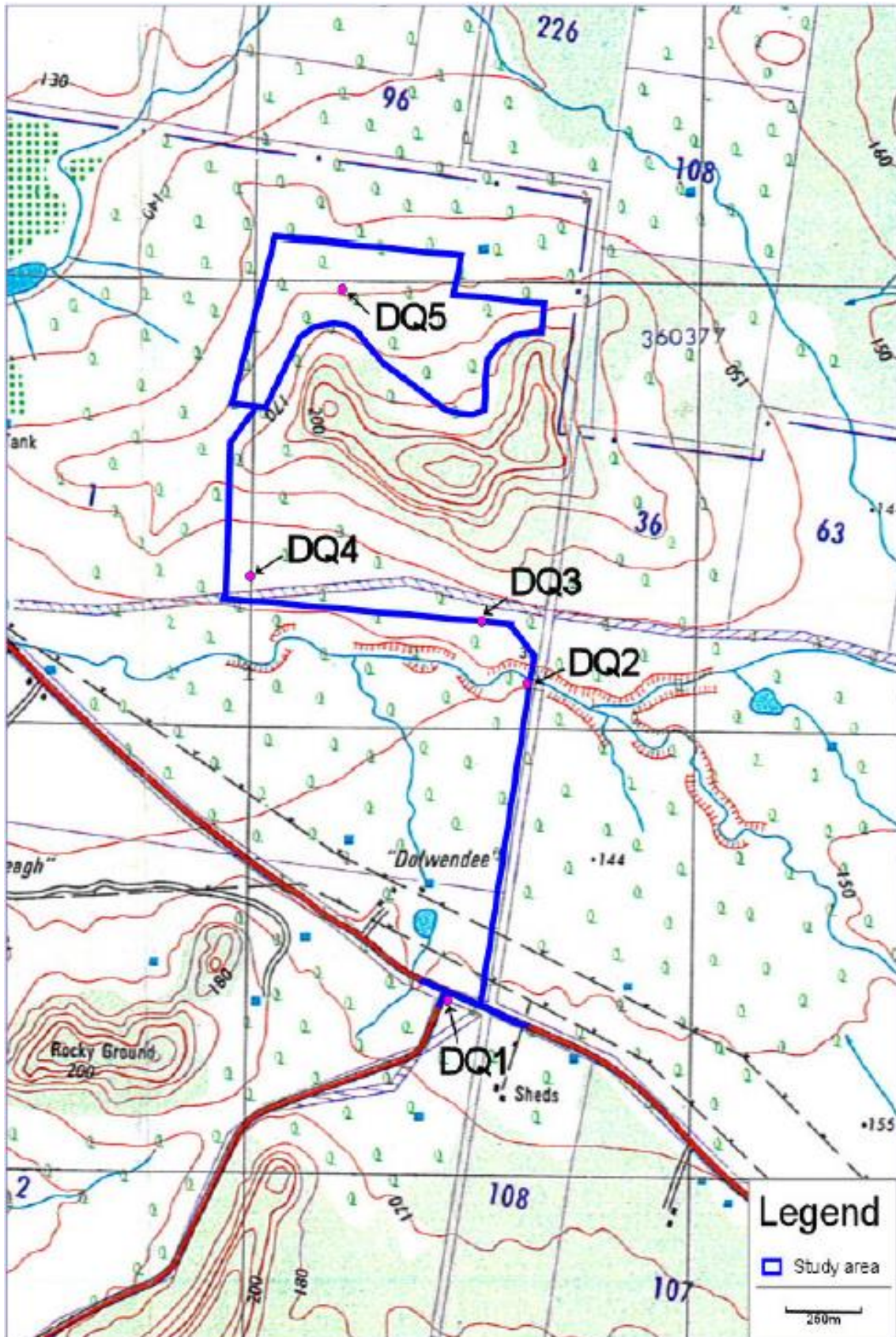


Figure 18 Aboriginal Sites Identified from Site Survey

Source: MCH (2015)

6.11.3. Impact Assessment

The OEH Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (2010:21) describes impacts to be rated as follows:

1. Type of harm: is either direct, indirect or none
2. Degree of harm is defined as either total, partial or none
3. Consequence of harm is defined as either total loss, partial loss, or no loss of value.

The results of the assessment have been summarised in **Table 57**.

Table 57 Impact Summary

Site	Site type	Type of harm	Degree of harm	Consequence of harm	Representative	Integrity	Research Potential	Scientific Significance
DQ/1	isolated	direct	total	total loss	well represented	poor	no	low
DQ/2	artefact scatter	direct	total	total loss	well represented	poor	no	low
DQ/3	isolated	direct	total	total loss	well represented	poor	no	low
DQ/4	isolated	direct	total	total loss	well represented	poor	no	low
DQ/5	isolated	direct	total	total loss	well represented	poor	no	low

MCH confirmed that the results of the assessment indicated that the five sites (DQ1 to DQ5) would be impacted upon by the Project. Four of the sites are isolated finds and one site with two artefacts. All sites are highly disturbed, are well represented both locally and regionally and hold little to no research or scientific potential.

Cumulative Impacts

The cumulative impact to Aboriginal heritage in the area is limited given that:

- The net development footprint (i.e. the area of direct impact) is small and does not affect a high proportion of any particular landform present within the region;
- A comparable suite of landforms (simple slopes) that are expected to, and do contain a similar archaeological resource occur in multiple contexts both within the local area and throughout the Hunter Valley;
- High density deposits identified to date occur outside the development footprint;
- The investigation area has been subject to long term past land uses (impacts) that have resulted in a highly disturbed landscape and as a consequence of these disturbances the representative value of the archaeological resource is lessened. Such impacts include clearing, agricultural practices, tracks, geotechnical investigations, dams, tracks and sheet wash; and
- The placement of the development within this area and within the disturbed context ensures the cumulative impacts are focused in the areas of lower potential and therefore are kept to a minimum.

6.11.4. Mitigation Measures

Management and mitigation measures to address potential Aboriginal heritage impacts are listed in **Table 58**.

Table 58 Aboriginal Heritage Mitigation Measures

Measure No.	Mitigation measure
AH1	The persons responsible for the management of onsite works will ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010, under the National Parks and Wildlife Act 1974.
AH2	Prior to the commencement of construction activities that will impact on sites DQ1 to DQ5, the Proponent shall provide for an appropriately qualified archaeological heritage consultant and registered Aboriginal stakeholders to collect any surface artefacts which would be affected by the construction of the SSD. The artefacts shall be lodged in a keeping place to be determined through consultation with the Aboriginal community.
AH3	In the event that unexpected Aboriginal objects are uncovered, all works likely to affect the objects shall cease and the OEH and of DoPI shall be notified of the find. Works shall not recommence until such time that the significance of the finds has been determined and management measures have been developed and implemented by an appropriately qualified archaeological heritage consultant, in consultation with registered Aboriginal stakeholders, and to the satisfaction of the Director-General.
AH4	<p>A Heritage Management Plan (HMP) will be developed in consultation with the registered Aboriginal stakeholders, the proponent and OEH and will detail how construction impacts on Aboriginal heritage will be minimised and managed. The HMP will include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> • Identification of Aboriginal objects directly and indirectly affected by the SSD; • Details of management measures to be carried out in relation to Aboriginal heritage, including a detailed methodology for the community collection of all artefacts associated with the SSD; • Procedures for dealing with previously unidentified Aboriginal objects, or an unexpected finds procedure, (excluding human remains) including cessation of works in the vicinity, assessment of the significance of the item(s), determination of appropriate mitigation measures by a suitably qualified archaeologist in consultation with the of DoPI, OEH and registered Aboriginal stakeholders, procedure for determining when works can recommence, and assessment of the consistency of any new Aboriginal heritage impacts against the approved impacts of the SSD, and registering of any new site(s) in the AHIMS database, • Details of an appropriate keeping place agreement with local Aboriginal community representatives for any Aboriginal objects salvaged during construction, • Details on the repatriation of any Aboriginal objects salvaged during the project, including location of re-burial and re-burial methods, and • Procedures for managing the discovery of confirmed or potential human remains, including the temporary cessation of works in the vicinity and notification to the NSW Police Force, OEH, the Department and registered Aboriginal stakeholders and not recommencing any works in the area unless authorised by the OEH and/ or the NSW Police Force.

6.12. Historic Heritage

6.12.1. Overview

To assess the presence of any potential historic heritage items a walkover inspection of the Project Area was undertaken to observe landscape features and identify any evidence of existing or relict structures that might have heritage significance. A review of the following databases was undertaken to determine the presence of any items of non-indigenous heritage in proximity to the Project:

- Muswellbrook Shire Council Local Environment Plan;
- State Heritage Register;
- Commonwealth Heritage Register;
- Register of the National Estate;
- Australian Heritage Database

6.12.2. Existing Environment

The Muswellbrook Shire Council Local Environment Plan (LEP) has identified one historic heritage site in the proximity of the Project Area. The site is the Hollydeen Shop and is identified as item number I42 (Lot 1, DP 382249) in the LEP. The Hollydeen Shop is located approximately 2 km to the west of the Project Area. The Project does not propose any activities that would potentially damage or impact the Hollydeen Shop heritage item. No other listed heritage items of relevance to the Project were identified.

The walkover inspection and discussions with the existing land owner reveal that there are no existing or relict structures or items of potential heritage significance within the Project Area. Review of existing and recent historical aerial photography similarly reveals that the history of the subject lands. Photographs 5, 14, 15, 16 and 18 describe the landscape character within the proposed quarry area. The site contains cleared grazing land with some regrowth, and no evidence of existing or former development.

6.12.3. Potential Impacts

The potential for impacts to any items of non-indigenous heritage are considered very low. Site investigations did not identify any suspected heritage items or areas of potential archaeological significance with the Project Area.

Proposed management measures are provided in the following section and are focused on the protection and management of any unexpected finds.

6.12.4. Mitigation Measures

Management and mitigation measures to address potential historic heritage impacts are listed in **Table 59**.

Table 59 Historic Heritage Mitigation Measures

Measure No.	Mitigation measure
HH1	If an item (or suspected item) of heritage is discovered during construction, all work in the area of the find will cease immediately and an officer from the Heritage branch of OEH would be notified immediately and advice sought for management of the object.
HH2	All site personnel are to receive a site induction that includes information on their responsibilities under the Heritage Act 1977.

6.13. Visual Amenity

This assessment reviews the existing visual character of the site and its surrounds and the expected impacts of the quarry on the existing visual character of the surrounds, nearby existing residences and publicly accessible locations.

More specifically, the visual assessment considers the following:

- The visual character of the surrounding landscape;
- Existing views to the Project;
- The sensitivity of the landscape to alteration by the Project;
- The visual character and extent of the proposed Project; and
- Viewer sensitivity to alteration of the environment by the Project.

6.13.1. Existing Conditions

The visual character of the area predominantly consists of agricultural land, rural residences and mining operations. The site is surrounded by the Xstrata-operated Mangoola Coal Mine site to the north and east and by other cleared rural properties to the south and west.

The existing landscape has a rural character comprising rolling hills which are predominantly cleared, with a backdrop of vegetated rocky ridges and mountainous areas in the distance. The built environment comprises scattered rural residences and farm buildings. Other dominant visual features of the area include a number of local roads, such as Reedy Creek Road, Wybong Road, Rosemount Road, and the Golden Highway.

The proposed quarry is to be largely obscured from view from the main traffic and tourism flow along the Golden Highway between Denman and Sandy Hollow, due to the visual protection that will be provided by the heavily timbered sandstone escarpment and ridge located between the proposed quarry and the highway. The proposed quarry would be located on the northern side of this natural barrier.

Figure 19 shows the visual envelope in which areas may be impacted by the proposed quarry which has been determined based on land elevations and topography surrounding the site. As shown, vegetation and topography would obscure or screen views to most public and private locations. **Figure 19** also shows the key viewpoints which were identified to assess the potential visual envelope to determine the visibility of the proposed quarry.

The visual assessment considered the extent of the quarry and its location to both public and private locations. **Photographs 1-3** and **Photograph 10** show some of the major viewpoints looking towards the quarry and demonstrate the very low visibility of the Project.

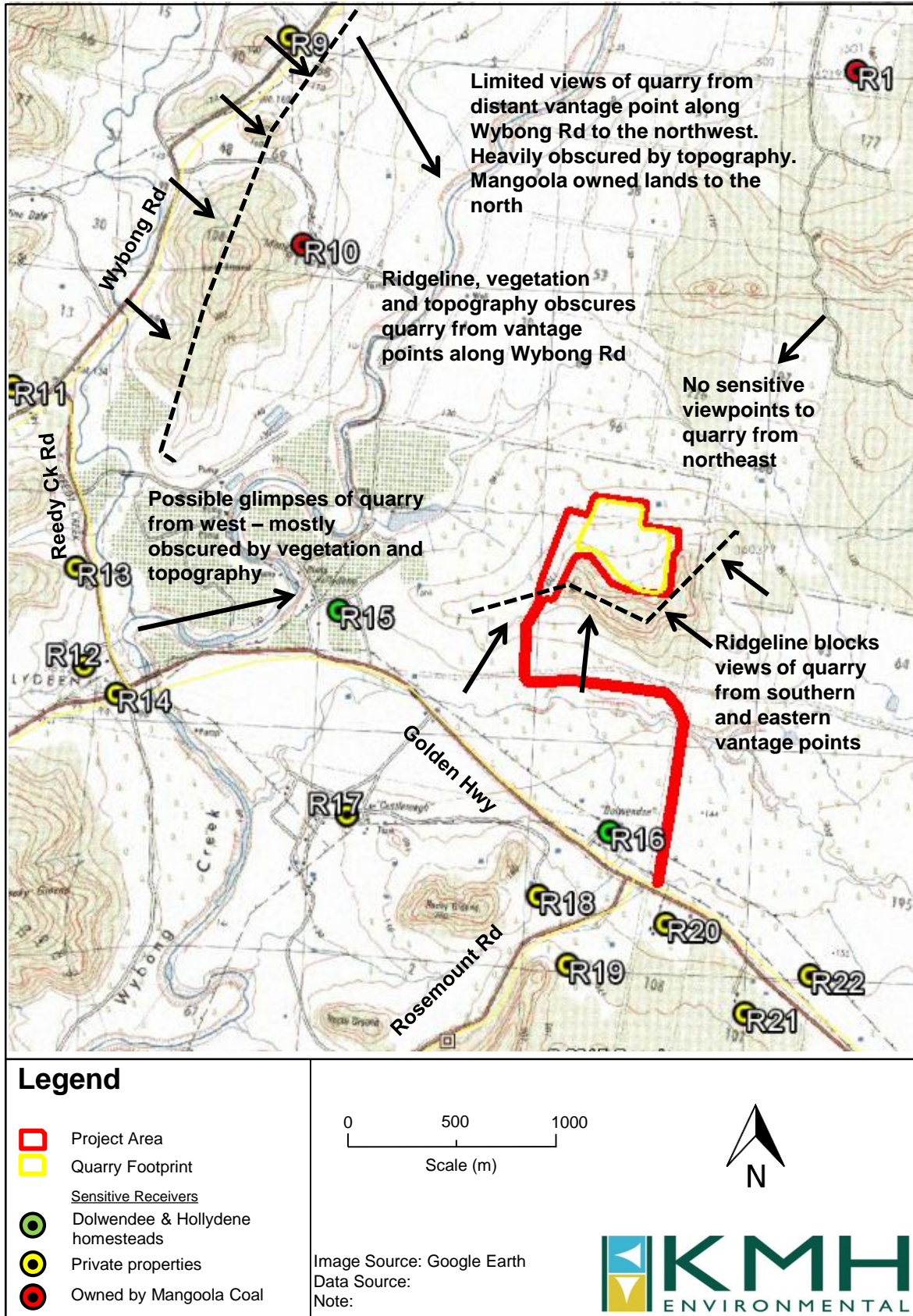


Figure 19 Viewpoint Analysis

6.13.2. Potential impacts

The assessment has found that landscape around the proposed development, generally has a high visual absorption capacity due to the existing terrain and the existing vegetation. This high visual absorption capacity corresponds directly with the generally low significance of impact to views from the Project.

Table 60 provides an overview of each of the key offsite receiver locations and the visual impact in relation to the quarry extent.

Table 60 Visual impact assessment

Viewing Site	Summary of findings	Potential Visual Impact
Golden Highway	Vegetation and topography prevents views to the quarry site Minor views to the haul road particularly the entrance	Negligible
Rosemount Road	Vegetation and topography prevents views to the Project site	Negligible
Reedy Creek Road	Reedy Creek Road is located more than 2 km away from the Project site. Wybong Creek and its associated riparian vegetation, and topography restrict views to the Project site	Negligible
Wybong Road	Wybong Road is located more than 2.5 km away from the Project site. Numerous topographic features (sandstone knolls and ridgelines) and vegetation restrict views to the Project site Negligible visibility to Project Area	Negligible
Southern Properties	The cluster of offsite residences to the south (R17 – R22) are located more than 1.5km away from the proposed. The major topographic feature of the rocky ridgeline immediately south of the quarry, prevents views of the quarry from these southern residences. Vegetation and topography limits views to the haul road though some minor views are likely.	Low
Western Properties	The western residences (R11-R14) are more than 2 km from the proposed quarry. Minor glimpses of small parts of the proposed quarry area may be visible from certain vantage points on these properties, particularly elevated locations, but not from the residences. Vegetation and topography substantially restricts views to the Project site. The Project extent would not significantly detract from the visual amenity at these properties	Low
Northern Properties	The properties to the north of the Project are for the most part owned by Mangoola Coal. Vegetation and topography greatly restrict views to the proposed quarry. The visual impact on these northern properties would be negligible	Negligible

The proposed quarry would only be visible from a very limited number of areas because of topography and vegetation. These areas are located to the west and northwest of the site, but not from any residences. At any offsite public or private location where the proposed quarry is visible, the distance to the quarry and the small percentage of the quarry in the field of view suggest the visual impact would be very low.

6.14. Hazards

6.14.1. Overview

This section assesses the Project in relation to the regulatory framework for the assessment of hazard and risk and provides an assessment of the potential impacts of the project in relation to hazard and risk according to the relevant guidelines, as well as in accordance with the SEARs for the project.

6.14.2. Existing Environment

The landscape of the Project is gently sloping and the natural vegetation of the area comprises native woodland and derived native grassland. The vegetation of the woodland areas is generally composed of an open, low woodland overstorey and a scattered short understory. An open shrub layer was common and ranged between 0.5 metres and 1.5 metres in height. Within the derived grassland, most woody vegetation has been previously cleared for agricultural purposes and the ground layer is dominated by native and introduced grasses and forbs.

The Mussellbrook Bush Fire Management Committee Bush Fire Risk Management Plan (2011) identifies community assets at risk and sets out a five-year program of coordinated multi-agency treatments to reduce the risk of bush fire to the assets. The plan categorises land into bush fire management zones. The Project area is considered within the “Land Management Zone (LMZ)”, but does not carry any specific asset i.d. within the treatment register. However, fire management would be undertaken as an important aspect to any land management activities during operation of the Project.

Dangerous goods stored on the project site would be limited to fuel, oils and lubricants. Refuelling of vehicles and plant would be carried out near the materials processing area where a bunded diesel tank with nominal 2 kL capacity would be located within a designated refuelling area. Approximately 338 kL of diesel is estimated to be consumed at the project site per annum.

Other oils and lubricants are to be stored in a controlled bunded area near the processing facility. No explosives would be stored onsite

6.14.3. Applying SEPP33

SEPP 33 applies to all developments that are considered to be **potentially hazardous industry** or **potentially offensive industry**.

Potentially hazardous industry is defined as “a development for the purposes of 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 in relation to the locality:

- a) to human health, life or property, or
- b) to the biophysical environment,

and includes a hazardous industry and a hazardous storage establishment.”

Where a development is considered to be a potentially hazardous industry, a preliminary hazard assessment (PHA) is required to be undertaken. The proposal would require the onsite storage of up to 2,000L of diesel (Class 3 Flammable Liquid). The nearest sensitive receiver is over 1.0 km away (the “Hollydene” residence owned by the Proponent) and the volume of flammable liquids to be stored on site is less than the risk screening thresholds in the SEPP.

Ammonia Nitrate (Class 5 Dangerous Good) would not be stored onsite and only transported to proposal site when blasting is required. Blasting will only be undertaken up to 12 times a year and therefore will be below the transportation screening thresholds in the SEPP.

Based on the above, the proposal does not meet the definition of a potentially hazardous industry and does not require a preliminary hazardous assessment to be undertaken in accordance with SEPP 33.

Potentially offensive industry is defined as “a development for the purposes of an 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 emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.”

The proposal will require an EPL for extractive industries under the Schedule 1 of the POEO Act. The proposal would operate under the conditions of an EPL which will provide adequate safeguards to control and prevent any offsite discharges of pollutants (eg. water, noise or odours). As such the proposal does not meet the definition of a potentially offensive industry.

6.14.4. Potential Impacts

The process of extracting materials from the quarry and the production of quarried products involves activities and operations that have the potential to be hazardous to human health, life or property and the environment. Potentially hazardous conditions or activities include spillage of dangerous goods, refuelling of vehicles and plant, the storage of fuel and other chemicals, stockpile and landform instability, machinery operation, explosives blasting and potentially contaminated run-off being produced from operations of the project site. The use and storage of flammable goods has the potential to result in off-site impacts including grass fires in the surrounding areas.

Potential risk hazards to public safety and environment include the following:

- Bushfire;
- Transport, handling and use of any dangerous goods;
- Refuelling of vehicles and plant
- Contaminated run-off from the site;
- Blasting (including fly rock and landslides); and
- Hazardous substances:
 - Explosives (would **not** be stored on site);
 - Oils (fuel oil - diesel and engine oil);
 - Welding gases;
 - Solvents/paints; and
 - Potentially some additives.

The Project area is readily able to be managed to reduce fuel loads and on-site provide fire protection measures can be provided. It should be noted that areas where plant and other vehicles will be working (e.g. processing area, within the quarry footprint and travel along roadways) will have been cleared of vegetation prior to works. Work health and safety aspects of the operations would be managed in accordance with relevant legislation.

Bushfire hazard

The Muswellbrook Bush Fire Risk Management Plan (2011) discusses the potential for bush fires in the Upper Hunter, with the bush fire season generally running from September to March. Prevailing weather conditions associated with the bush fire season is north-west to westerly winds accompanied by high daytime temperatures and low relative humidity. There are also many dry lightning storms that

occur during the bush fire season. Preventing the ignition of bush fires by human activities, particularly on days when severe bush fire weather conditions prevail, is an important strategy for managing bush fires.

The likelihood and consequences of a bush fire impacting community assets involves consideration of fuel/vegetation type and arrangement, slope, separation of assets from fuel, and the vulnerability and resilience of the asset. Assets include human settlements, economic, environmental and cultural (aboriginal and non-aboriginal).

There exists the potential for bushfire in areas of grassland and woodland on the perimeter of the Project where vegetation would be retained. Buildings and equipment would be used by on-site staff for construction and operations increasing risk of human-caused bushfires.

Therefore, a Fire Management Plan would be prepared in consultation with the NSW Rural Fire Service and a Bush Fire Emergency Evacuation Plan prepared in accordance with the NSW Rural Fire Service document *A Guide for Developing a Bush Fire Emergency Evacuation Plan* (2004). Further, all structures associated with the development would have a minimum 10m Asset Protection Zone (APZ) that would be maintained as an inner protection area (IPA) as outlined within section 4.1.3 and appendix 5 of *Planning for Bush Fire Protection 2006* and the NSW Rural Fire Service's document *Standards for Asset Protection Zones*. The recommended 10m APZ is readily achievable based on the planned development layout and proximity to vegetation, and any clearing that would be required is included within the Project Area assessed for clearing as part of the biodiversity assessment.

Storage and handling of dangerous goods

In the event of a spill or leak from a diesel storage tank, spilled diesel would be contained within the bunded area. Although unlikely, damage to the bund could result in a spill not being contained and potentially contaminating the surrounding area. The risk of this is negligible.

Chemical storage areas, as well as fuel storage areas are a potential source of contamination. Chemical leaks from storage areas could potentially result in the addition of chemicals to surface water or groundwater and may result in contamination of offsite and onsite water and soils.

Provided all potentially hazardous chemicals are stored in sealed, bunded areas, the risks associated with leaks and spills are minor.

Vehicle and plant refuelling

Fuel spills could potentially occur where vehicles and plant are refuelled. The extent of a spill would be restricted by appropriate bunding and ensuring refuelling is undertaken in appropriate locations with spill controls in place. Fuel spills could also increase the risk of bushfire by providing combustible fuel, potentially resulting in fire.

Contaminated run-off

Contaminated run-off could potentially be generated from the diesel storage areas, and from areas where vehicles are stored, maintained and/or refuelled.

Hydrocarbon and heavy metals in surface runoff may occur as a result of refuelling or spills. Sediment from stockpiling and disturbed areas in general may contribute to turbid stormwater runoff which may have detrimental impacts to surface drainage systems.

Contaminated lands

There are no historic records suggesting contaminating activities (e.g. livestock tick dip sites or agricultural fuel storage facilities) were once located within the Project Area. No records of historical contamination within the Project Area from historical activities are recorded in the OEH Contaminated Lands Record or property records kept by Muswellbrook Shire Council. In addition there was no evidence of historic contamination or hazardous materials within the Project Area during the site visits undertaken by the project team or through the examination of historical aerial photography over the

past 10 years. It is therefore unlikely that contaminated land will be disturbed during the construction and operation of the Project.

6.14.5. Mitigation Measures

Management and mitigation measures to address potential impacts from hazards are listed in **Table 61**.

Table 61 Hazards Mitigation Measures

Measure No.	Mitigation Measures
H1	<p>A Fire Management Plan would be prepared in consultation with the NSW Rural Fire Service that addresses the following requirements:</p> <ul style="list-style-type: none"> • Contact person / department and contact details; • Objectives of the Fire Management Plan and statement of how the proponent intends to comply with clause 63 (2) and 64 of Part 4 Division 1 of the Rural Fires Act 1997; • Water supply for fire fighting purposes, its location and use by/compatibility with NSW Rural Fire Service Tankers; • Fire fighting capability and preparedness; • Location of fire trails and schedule and description of works for their construction and their continued maintenance; • Details of any proposed boundary fuel breaks or fire breaks; and • Any proposed prescribed burning.
H2	<p>A Bush Fire Emergency Evacuation Plan shall be prepared in accordance with the NSW Rural Fire Service document 'Guide for Developing a Bush Fire Emergency Evacuation Plan'.</p>
H3	<p>All structures associated with the development shall have a minimum 10m Asset Protection Zone (APZ) that shall be maintained as an inner protection area (IPA) as outlined within section 4.1.3 and appendix 5 of Planning for Bush Fire Protection 2006 and the NSW Rural Fire Service's document 'Standards for asset protection zones'.</p>
H4	<p>Spill kits would be maintained on the Project at storage, and refuelling areas. A mobile spill kit would be kept on the site where plant, machinery and equipment is stored and used during quarry operations.</p>
H5	<p>All on-site staff would be informed of the site's Emergency Response Plan procedures to be undertaken on-site as part of their training.</p>
H6	<p>Refuelling of vehicles and plant on the project site would be carried out in the designated and bunded refuelling area.</p>
H7	<p>Bunding would be installed for chemical, lubricants, fuels and oil storage areas in accordance with relevant guidelines and Australian Standards.</p>

6.15. Socio-economic Assessment

6.15.1. Overview

The Project has the potential to create positive economic benefits for the region in terms of employment creation, use of local goods and services, and the supply of quarried products at a competitive price to the growing upper Hunter and broader Newcastle Region. This section assesses the social and economic environment within which the Project is located and the potential interactions

of the project with this environment. The statistical data referenced in this section is drawn from the census data compiled by the Australian Bureau of Statistics (ABS) for 2011.

6.15.2. Existing Environment

The Project is located within the Shire of Muswellbrook within the Upper Hunter Valley approximately 130km north-west of Newcastle. Muswellbrook Shire covers approximately 3,402km² and consists of two larger towns, Muswellbrook and Denman, as well as a number of outlying rural communities including Sandy Hollow, Wybong, Baerami, Martindale, Widden, McCullys Gap and Muscle Creek.

Industry in Muswellbrook Shire includes agriculture, viticulture, equine, power generation and coal mining. Muswellbrook Shire is the main centre for New South Wales' power generation capacity. It has become the major centre of Upper Hunter coal mining, with the largest concentration of open cut mining operations and major expansion of mining approvals over the last few years and the second highest rate of coal extraction of any region in New South Wales.

In 2014, Muswellbrook's population was approximately 17,045. In 2011, it was estimated that 5.4% of the population were Aboriginal and Torres Strait Islander Peoples.

In the period between 2006 and 2014, Muswellbrook Shire experienced population growth from 15,639 persons to 17,045 persons, a 1.1% average annual growth rate, less than the average of NSW (1.3%). Muswellbrook Shire is expected to have an average annual growth rate of 0.8% through 2031, which is less than the average predicted for NSW (1.2%).

A comparison of the age breakdown of the Muswellbrook Shire with New South Wales shows that Muswellbrook has a comparatively young population, with a higher percentage of people aged under 24 and fewer mature aged adults over 55. **Table 62** breaks down the statistics from the 2011 Census showing population by age groups.

Table 62 Population statistics

Characteristic	Muswellbrook Shire		NSW	
	No.	%	No.	%
Infants/Toddlers (0-4)	1300	8%	458,735	6.6%
Children (5-14)	2,400	15%	873,776	12.6%
Young Adults (15-24)	2,350	14%	893,103	12.9%
Adults (25-54)	6,950	42%	2,863,576	41.4%
Mature Adults (55-64)	1,700	10%	810,290	11.7%
Aged (65+)	1,700	10%	1,018,178	14.7%

Source: Australian Bureau of Statistics, Regional Population Growth, Australia.

Employment

Mining is considered the top industry of employment in Muswellbrook Shire, followed by the retail trade and then agriculture, forestry and fishing. In 2011, the mining industry employed approximately 21% of the labour force, compared to 7.1% in the agriculture, forestry and fishing industry. However, recent data shows a recent increase in the unemployment rate which rose from a low of 3.0% in 2012 to 6.7% in 2014. **Table 63** summarises the employment statistics relative to NSW.

Table 63 Employment statistics

Statistic	Muswellbrook		NSW	
	No. employed	% in labour force	No. employed	% in labour force
Worked full time	4,954	63.7	2,007,924	60.2
Worked part-time	1,944	25.0	939,465	28.2
Away from work	507	6.5	190,944	5.7
Unemployed	375	4.8	196,525	5.9
Total in labour force	7,780	--	3,334,858	--

*People who reported being in the labour force, aged 15 years and over

Table 64 demonstrates that the individual personal median weekly income in the Muswellbrook LGA was \$619, which is higher than the NSW State average of \$561.

Table 64 Median weekly income

Median weekly incomes	Muswellbrook	NSW
Personal	619	561
Family	1,697	1,477
Household	1,399	1,237

*People who reported being in the labour force, aged 15 years and over

Industry

The Hunter Valley's unique topography, soil, air, water and amenities, makes it an ideal location for the horse breeding industry. The industry is a significant regional, state and national employer, employing thousands of people directly and indirectly in the region and supports communities across its value chain from feed merchants, saddlers and veterinarians through to the racing industry.

Additionally, the unique topography, climate and soils have reinforced a strong viticulture in the Shire, which is home to a significant proportion of the wine industry in the Upper Hunter Region. The wine industry has the potential to provide positive flow-on and long-term benefits including improved tourism, economic development and employment opportunities.

Muswellbrook Shire Council published a series of strategic landuse strategies to guide the future use of lands within their boundary. The Project is within land classified and mapped as important equine land within the Equine Industry Landuse Strategy. Additionally, the Project lay on the edge of land classified and mapped as important viticultural land within the Viticultural Industry Landuse Strategy.

6.15.3. Potential Impacts

Social

The potential adverse social impacts of the Project would largely be to general amenity aspects such as visual, noise, air quality, traffic and potential land use impacts.

The Project would result in a minimal increase in traffic along Golden Highway, equivalent to an average of one extra vehicle every 20 to 30 minutes. The traffic impact assessment has concluded that the Project would not have noticeable effects on the operation of the surrounding road network.

Visual impacts are not expected to be significant due to:

- The main quarry footprint is concealed behind the north side of a ridgeline and is not visible from the Golden Hwy;
- The existing character of the project site.
- The lack of visibility of the quarry and processing facility by sensitive receivers.

The distance from the processing facility and the nearest sensitive receivers is considerable and as a result impacts due to potential noise, air and dust emissions are minor.

The EIS has assessed the key aspects with potential to cause nuisance impacts. The Project is not predicted to present unacceptable impacts to local residents and the community. A variety of mitigation measures are recommended in this EIS that would be implemented as part of the Project to ensure that potential amenity impacts are minimised.

Positive social impacts will result from increased employment within the region. This would include direct employment of approximately 3-5 employees full time, as well as casual and contractor employment during construction and operation. Local businesses will benefit from use of local goods and services.

Economic

Adequate supply of a range of crushed rock products is essential to meet the needs of road works and other construction projects within the Upper Hunter and Newcastle regions. Should the Project not proceed, there would be a decreased supply to the local community and unrealised employment opportunities.

Quarry operations would generate more than 5 million tonnes of construction materials that would assist in local mining and construction projects and contribute to economic development in the Upper Hunter and beyond. The quarry would be operated by between 3 and 5 people, including a Site Manager, equipment operators and administration/sales staff. There may be 8-10 people employed during construction. This would generate direct economic benefits to the region. Use of contractors would also occur, eg drill and blast contractors, maintenance technicians. Indirect employment and economic growth would also be generated through demand for goods and services from local businesses by staff and contractors associated with the works.

The project would have positive economic impacts on the local area and wider Upper Hunter and Newcastle Regions through the direct flow of construction and operational expenditure to staff and contractors.

Where possible, construction equipment, goods and services and technology is to be sourced from local or regional suppliers, benefiting both the Muswellbrook LGA and larger Upper Hunter economies. This practice is expected to continue into the future.

Equine and Viticulture

The agricultural assessment (**Appendix D**) identified the Project area as having a low to very low agricultural production potential and would therefore not significantly lower the overall agricultural productivity potential of this property or the surrounding district. Further, the Project is not predicted to

have any appreciable adverse impact on local equine and viticultural industries. Therefore, the Project is considered compatible with viticulture and equine industry.

6.15.4. Mitigation Measures

Mitigation measures addressing potential social impacts related to agriculture, noise, traffic, air quality (dust) and visual impacts are provided within this EIS. Provided that the recommended safeguards are implemented, the social impacts of the project are considered to be acceptable, particularly when considered in the context of the economic contribution to the local and regional economy.

Additional mitigation measures to address potential socio-economic impacts are listed in **Table 65**.

Table 65 Socio-economic Mitigation Measures

Measure No.	Mitigation measure
SE1	A complaints handling procedure and register would be implemented to assist in recording and managing potential conflict with the local community during quarry operations.

6.16. Traffic and Transport

6.16.1. Overview

A traffic impact assessment was undertaken by Colston Budd Hunt & Kafes (2012) and is provided in **Appendix P**. This report examined the traffic implications of the proposed Project focusing on interactions with the Golden Highway.

6.16.2. Existing Environment

The Project is located on the Golden Highway, some seven kilometres west of Denman. It is part of a rural land holding north of the Golden Highway, with the surrounding land use being primarily rural.

The Golden Highway connects Singleton, Jerrys Plains and Denman in the east with Merriwa and Dubbo in the west. In the vicinity of the site it provides a two lane two-way carriageway with sealed shoulders and a 100 kilometre per hour speed limit (refer **Photographs 11-12**).

Rosemount Road intersects Golden Highway near the site. It provides a two lane, two-way road which connects back to Denman. The intersection of Golden Highway with Rosemount Road is a t-intersection controlled by give way signs. There is a short left turn deceleration lane on the highway for turns into Rosemount Road.

Table 66 shows that the Golden Highway carried some 160 to 190 vehicles per hour during the surveyed morning and afternoon peak hours. Rosemount Road carried very low flows of some 10 and 20 vehicles per hour during the morning and afternoon peak hours respectively.

Table 66 Existing two-way (sum of both directions) peak hour traffic flows

Road	Location	AM peak hour	PM peak hour
Golden Highway	East of Rosemount Road	190	170
	West of Rosemount Road	190	160
Rosemount Road	South of Golden Highway	10	20

The capacity of the road network is largely determined by the capacity of its intersections to cater for peak period traffic flows. The intersection of Golden Highway with Rosemount Road was analysed using the SIDRA program for the traffic flows during the weekday morning and afternoon traffic flows.

SIDRA simulates the operations of intersections to provide a number of performance measures. The most useful measure provided is average delay per vehicle expressed in seconds per vehicle. The SIDRA analysis found that the intersection of Golden Highway with Rosemount Road is operating with average delays for the highest delayed movement of less than 15 seconds per vehicle during morning and afternoon peak periods. This represents a good level of service with acceptable delays and spare capacity.

6.16.3. Potential Impacts

Vehicular access to the site would be via a new intersection on the Golden Highway, some 100 to 120 metres east of Rosemount Road. The new access road would run north from Golden Highway and provide a two-way connection between the Golden Highway and the proposed quarry area.

The very low traffic volumes turning to and from the proposed new access road would not require special treatment at the intersection of Golden Highway. The intersection would operate at a good level of service, and there are good sight lines in both directions on Golden Highway.

Material extracted from the quarry would be carried by truck/trailer combinations and b-doubles, which carry some 33 and 39 tonnes each respectively. Based on an extraction rate of up to 250,000 tonnes per annum, and some 270 days operation per year, the proposed quarry would generate up to some 25 to 30 laden vehicles per day. Over a 10 hour working day, this is equivalent to some two to three trucks per hour (four to six movements two-way). It is likely that approximately 90% of movements would be eastbound along the Golden Highway.

Such a low traffic generation would not have noticeable effects on the operation of the surrounding road network. Turning volumes at the intersection of Golden Highway with the quarry access road would be less than the existing turning volumes at the Golden Highway/Rosemount Road intersection. The proposed access intersection would operate with average delays of less than 15 seconds per vehicle. This represents a good level of service.

Traffic from the proposed development is therefore not expected to result in any unusual safety issues at the intersection. A standard rural intersection is proposed where the haul road meets the Golden Highway. UHH proposes to consolidate the existing approved accesses to the Dolwendee property from three down to two which would likely be favourable to RMS and represent a positive impact on the road network.

Consultation with RMS would occur over the intersection design and any necessary approvals from RMS such as a Works Authorisation Deed (WAD) sought.

6.16.4. Mitigation Measures

The traffic mitigation measures for the Project are summarised in **Table 67**:

Table 67 Traffic Mitigation Measures

Measure No.	Mitigation measure
T1	Appropriate on-site parking would be provided for on-site quarry staff.
T2	Access would be provided for the Project via a new road that would connect to the Golden Highway, east of Rosemount Road.
T3	Consult with RMS and obtain any necessary approvals for the access road intersection with the Golden Hwy.

6.17. Waste Management

The Project has the potential to generate waste from quarry activities and general site use. This section describes the type and classification of waste that would be handled, stored and/or disposed of at or from the site. The potential impacts of the Project are assessed in regard to waste generation during the establishment, operation and closure of the quarry.

A description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage and/ or monitor the potential impacts associated with the waste generated, as a result of the proposal, are provided.

6.17.1. Overview

The principles of the waste hierarchy as described in the Waste Avoidance and Resource Recovery Act, 2001 (WARR Act) are considered. This hierarchy provides guidance on the most preferable approach to managing waste, starting with the most sustainable option (avoiding the creation of waste) and with the least desirable option being disposal to landfill. Waste generated from the project will be managed in accordance with the principles of the hierarchy.

6.17.2. Existing Environment

Currently there are no activities in the Project Area that would generate waste.

Activities proposed during the construction, operation and closure of the quarry that would generate potential waste include the following:

- vegetation removal;
- construction of roads;
- construction of runoff diversions;
- stripping of topsoil and subsoils;
- extraction, screening and stockpiling of the raw materials;
- product loading and distribution;
- Plant maintenance: used oils, hydraulic and other plant fluids;
- general use and management of the quarry site by on-site staff: office waste and sewage and wastewater effluent

The Project would generate the following waste types:

- Excavated material (if unsuitable for commercial use);
- Domestic waste;
- Green waste;
- Construction waste;
- Effluent from staff ablutions facilities;
- Used lubricants and oils;
- Potentially contaminated soil (e.g. spills); and
- Runoff from disturbed areas and the processing area.

The classification and description of each of the general waste types to be potentially generated by the proposal is summarised in **Table 68**.

Table 68 Potential Waste Generated On-site

Waste material and description	Waste Classification	Management Details
Excavated soil Topsoil, subsoil, rock, gravel and silt	General Solid Waste (non-putrescible)	All excavated soil not suitable for product would be re-used to establish safety and runoff control bunds (subsoil), revegetation (topsoil) and/or fill.
Green Waste Trees, shrubs.	General Solid Waste (non-putrescible)	Clearing would be managed progressively through quarry stages. Vegetation would be re-used for fence posts, mulch and stockpiled on site for revegetation works.
General Construction Waste Concrete, metal, timber, fittings, strapping, plastic wrapping, packaging.	General Solid Waste (nonputrescible)	All attempts would be made to separate and reuse or recycle building materials hence the volume of construction material waste is expected to be minimal.

Domestic Waste Paper, aluminium cans, plastics, packaging etc. generated by onsite staff.	General Solid Waste (non-putrescible and putrescible)	The limited general waste generated on-site would be collected and disposed of appropriately (in Council collection bins and/or landfills).
Liquid Waste Oil, paint, lubricants, glue etc.	Liquid Waste	A limited amount of liquid waste is expected to be generated by the Project. Liquid wastes would be stored and disposed of appropriately.
Contaminated Soil Potential spills of chemicals or fuel that could result in contaminated soil.	TBD	Would require disposal to an appropriately licenced landfill or trade waste facility.
Wastewater Dewatering of pits and sediment basins.	Liquid Waste	Wastewater would be re-used for dust control and watering of revegetation areas on-site as far as practicable.
Biological Waste (Sewage) On-site staff use of toilets.	Liquid Waste and General Solid Waste (putrescible)	The site would be equipped with a suitable small on-site sewage facility (e.g. aerated wastewater treatment system) approved in accordance with Section 68 of the Local Government Act. It is expected that less than 500L per day of effluent would be generated.

6.17.3. Potential Impacts

Potential impacts from the production and inappropriate disposal of waste generated from the Project includes:

- Pollution of land and waterways
- Air pollution
- Overuse of scarce resources
- Human and animal health impacts

6.17.4. Mitigation Measures

All waste would be managed in accordance with the requirements of the Waste Avoidance and Resource Recovery Act 2001, the PoEO Act 1997, the OEH Waste Classification Guidelines 2009 (DECCW, 2009) and the principles of the waste management hierarchy.

Waste mitigation measures are summarised in **Table 69**.

Table 69 Waste Mitigation Measures

Measure No.	Mitigation measure
W1	The CEMP prepared prior to construction of the Project will document waste management strategies and mitigation measures including : <ul style="list-style-type: none"> • Volumes and types of wastes anticipated • system of in-situ classification of waste material in accordance with EPA's Waste Classification Guidelines • storage and treatment of stockpiles and waste • on-site sewage treatment system and management

Measure No.	Mitigation measure
W2	Waste management strategies and mitigation measures would be communicated to all employees and contractors during site induction, prior to commencing works at the site.
W3	Waste oil, hydraulic and other hazardous materials will be stored in secure containers and kept in bunded and covered area. Hazardous wastes would be transported to a facility that is appropriately licensed to receive and recycle or treat hazardous wastes.

6.18. Greenhouse Gases and Energy

6.18.1. Introduction

Greenhouse gas (GHG) emissions will result from activities associated with the Dolwendee quarry that consume energy. This section outlines the approach used to estimate emissions of greenhouse gases and provides an interpretation of their impact.

GHG emissions refer to the six direct greenhouse gases regulated by the United Nations Framework Convention on Climate Change (UNFCCC, 1992) and the Kyoto Protocol:

- carbon dioxide (CO₂);
- methane (CH₄);
- nitrous oxide (N₂O);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- sulphur hexafluoride (SF₆).

The project will release greenhouse gases, predominantly carbon dioxide (CO₂), through the combustion of fossil fuels.

6.18.2. Greenhouse Gas and Energy Assessment Framework

The National Greenhouse Accounts (NGA) Factors (DOE DEC 2014) provides the methodologies and emission factors for calculating greenhouse gas emissions and energy data under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). The assessment framework also incorporates the principles of The Greenhouse Gas Protocol 2004 (WRI/WBCSD March 2004). The Greenhouse Gas Protocol provides an internationally accepted approach to greenhouse gas accounting. The Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

GHG emissions from the Dolwendee quarry can be categorised as 'direct' and 'indirect emissions.

Scope 1 covers direct emissions from sources within the boundary of an organisation such as fuel combustion and manufacturing processes;

Scope 2 covers indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation. Scope 2 emissions result from the combustion of fuel to generate the electricity, steam or heat and do not include emissions associated with the production of fuel. Scopes 1 and 2 are carefully defined to ensure that two or more organisations do not report the same emissions in the same scope; and

Scope 3 includes all other indirect emissions that are a consequence of an organisation's activities but are not from sources owned, or controlled, by the organisation.

Scope 1, 2 and 3 emissions were calculated based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2014 (DOE DEC 2014).

6.18.3. Greenhouse Gas Impact Assessment

The Dolwende quarry predicted direct and indirect greenhouse gas emissions for the operational and construction phases are:

Scope 1 emissions – Predicted direct greenhouse gas emissions are forecast to be approximately 23,047 t CO₂-e over the life of the operational quarry or approximately 914 t CO₂-e per annum mainly due to the consumption of diesel associated with the use of diesel powered trucks, loaders and mobile plant (e.g. mobile crushing plant and screens). Scope 1 emissions for the approximately 12 week construction phase are forecast to be approximately 206 t CO₂-e per annum.

Scope 2 emissions – Predicted indirect greenhouse gas emissions are forecast to be approximately 0 t CO₂-e over the life of the quarry (construction and operation) mainly due to there being no consumption of offsite-generated electricity.

Scope 3 emissions – Predicted indirect and downstream greenhouse gas emissions are forecast to be approximately 1,748 t CO₂-e over the life of the quarry operations or approximately 69 t CO₂-e per annum mainly due to the consumption of third party transport and product fuel. Scope 3 emissions for the 12 week construction phase are forecast to be approximately 16 t CO₂-e per annum.

The following Scope 3 emissions which are not generally included in GHG calculations were not included in this assessment:

- disposal of waste generated at the facility;
- employee business travel;
- employees commuting to and from work;
- extraction, production and transport of other purchased materials and goods; and
- out-sourced activities.

The project is anticipated to extract, transport, and subsequently process up to 250,000 tonne per annum of material. The predicted direct greenhouse gas emission rate is forecast to be approximately 0.004 tCO₂-e per tonne of material extracted, transported and subsequently processed.

Table 68 and **Table 69** present summaries of the greenhouse gas calculations for the operation and construction stages, respectively.

Table 70 Greenhouse Gas Assessment – Operation

Item	Type details /	Quantity	Typical hours per day	Days operating per year	Annual Hours	Con- sumption Rate (L/h)	Con- sumption Rate (kL/annum)	Emission Factor ¹ (tCO ₂ -e/kL)	Emission Factor ² (tCO ₂ -e/kL)	Scope 1 Emissions (tCO ₂ -e/annum)	Scope 2 Emissions (tCO ₂ -e/annum)	Scope 3 Emissions (tCO ₂ -e/annum)		
Operation								Direct Diesel Consumption	Indirect Diesel Fuel Extraction	Diesel combustion on-site (automotive) Natural Gas & LPG usage	Electricity	Indirect emissions from fuel extraction and transmission line loss associated with electricity supply. Indirect emissions from fuel extraction associated with diesel fuel supply.		
Dozer	D9	1	9	150	1350	20	27.0	2.7	0.2	72.8	No Electricity Consumed	5.5		
Mobile Crusher 1	Jaw	1	9	150	1350	20	27.0	2.7	0.2	72.8		5.5		
Mobile Crusher 2	Cone	1	9	75	675	20	13.5	2.7	0.2	36.4		2.8		
Mobile Screen	2 Deck	1	9	150	1350	15	20.3	2.7	0.2	54.6		4.1		
Excavator	30t	1	9	150	1350	30	40.5	2.7	0.2	109.3		8.3		
Loader	972	1	9	200	1800	30	54.0	2.7	0.2	145.7		11.0		
Off-road trucks	30t Dump Trucks	2	9	100	1800	20	36.0	2.7	0.2	97.1		7.4		
Road Trucks	truck and dog or semi	3	9	200	5400	15	81.0	2.7	0.2	218.5		16.6		
Water cart	12kL capacity	1	9	200	1800	15	27.0	2.7	0.2	72.8		5.5		
Diesel Generator	1	1	9	200	1800	5	9.0	2.7	0.2	24.3		1.8		
Drill Rig	1	1	9	25	225	15	3.4	2.7	0.2	9.1	0.7			
							TOTAL	338.6			TOTAL	913.7	0.0	69.3
											TOTAL (Scope 1 + 2 + 3)	982.9		

Table 71 Greenhouse Gas Assessment – Construction

Item	Type / details	Quantity	Typical hours per day	Days operating per year	Annual Hours	Consumption Rate (L/h)	Consumption Rate (kL/annum)	Emission Factor ¹ (tCO ₂ -e/kL)	Emission Factor ² (tCO ₂ -e/kL)	Scope 1 Emissions (tCO ₂ -e/annum)	Scope 2 Emissions (tCO ₂ -e/annum)	Scope 3 Emissions (tCO ₂ -e/annum)
Construction (haul road)												
30t Excavator		1	9	60	540	30	16.2	2.7	0.2	43.7	No Electricity Consumed	3.3
3 x 30t Dump Trucks		3	9	30	810	20	16.2	2.7	0.2	43.7		3.3
Padfoot		1	9	30	270	15	4.1	2.7	0.2	10.9		0.8
Smoothdrum		1	9	40	360	15	5.4	2.7	0.2	14.6		1.1
Dozer		1	9	20	180	30	5.4	2.7	0.2	14.6		1.1
Truck and Dogs		3	9	30	810	15	12.2	2.7	0.2	32.8		2.5
Grader		1	9	40	360	25	9.0	2.7	0.2	24.3		1.8
Water cart		1	9	60	540	15	8.1	2.7	0.2	21.9		1.7
						TOTAL	76.5		TOTAL	206.4	0.0	15.7
											TOTAL (Scope 1 + 2 + 3)	222.1

6.18.4. Impact on National Policy Objectives

The Australian Government has committed to reducing Australia's greenhouse gas emissions by 5 per cent from 2000 levels (which were 553,000,000 t CO₂-e per annum of greenhouse gas emissions) by 2020. This equates to 525,000,000 t CO₂-e per annum of greenhouse gas emissions for the nation in 2020 (National Greenhouse Gas Inventory 2011).

The quarry will contribute approximately 1,120 tCO₂-e of Scope 1 emissions per annum which is negligible and unlikely to prevent Federal Government achieving its national greenhouse gas objectives.

6.18.5. Impact on International Policy Objectives

There is currently no comprehensive global agreement on greenhouse gas reduction targets that includes all major emitters such as China, India and the United States. The most relevant international commitment made by Australia is under the United Nations Framework Convention on Climate Change in 2010, whereby Australia has committed to reducing its 2020 national greenhouse gas inventory by 5 per cent (based on 2000 inventory).

This commitment aligns with the national objectives and therefore the Dolwende quarry is unlikely to prevent the Federal Government achieving its national or international greenhouse gas reduction targets.

6.18.6. Greenhouse Gas Emission Management and Monitoring

To ensure that energy consumption and greenhouse gas emissions are minimised the following management measures are being considered for future operations:

- Internal reviews to identify techniques to minimise energy and fuel use and assess if equipment is operating at optimum energy levels;
- Ensuring that equipment is maintained to retain high levels of energy efficiency;
- Reviewing fuel efficiency of equipment and considering procurement of new equipment if efficiency opportunities are identified;
- Implement a program to review diesel use efficiency and include fuel efficiency in equipment procurement decisions;
- Monitoring developments in alternative fuel technology and considering biodiesel compatibility in future procurement decisions;
- Reviewing solar power options for the offices and amenities; and
- Continue to investigate and where feasible, implement initiatives to reduce energy consumption and greenhouse gas emissions.

The project has identified the most energy efficient methods and equipment that can be applied at this facility and efficiency of equipment will be a key consideration in procurement of future equipment. Greenhouse gas emissions and intensity of production will be monitored on an annual basis.

6.19. Landscape Rehabilitation and Closure

The long-term rehabilitation of the project site is of key importance, as it will determine how environmental issues (such as sedimentation, dust and water runoff) will be adequately managed post quarry closure, so as to allow for the productive use of the land in the longer term.

6.19.1. Overview

A detailed Rehabilitation and Closure Strategy would be prepared at a later stage as the quarry is nearer to closure, approximately during stage 3 of development. The following criteria would inform the final strategy:

- The principles set forth in the Strategic Framework for Mine Closure (ANZMEC, 2000);
- A better understanding of the in situ geology and surface water intake on the site once stages 1 and 2 of the Project are complete; and
- The Blue Book.

The '*Strategic Framework for Mine Closure*' developed by ANZMEC and Minerals Council of Australia (ANZMEC, 2000) was designed to provide a broad framework for mine closure. It outlines objectives and principles to be considered in the development of a closure plan that address stakeholder involvement, planning, standards, finance and implementation.

The Rehabilitation and Closure Strategy would be prepared for the site to promote an integrated approach to quarry rehabilitation and management. In line with the SEARs for the project, the Rehabilitation and Closure Strategy would present the proposed rehabilitation and closure strategy for the site, having regard to the key principles in the Strategic Framework for Mine Closure (ANZMEC, 2000), including:

- Stakeholder involvement,
- Planning,
- Financial provision
- Implementation,
- Standards and
- Relinquishment

The Dolwende Extraction and Operation Plan (Appendix G) includes a Mine Closure Check List that addresses the six key areas outlined in the Strategic Framework for Mine Closure.

6.19.2. Stakeholder Involvement

Consultation with the key residential receivers was undertaken in October 2015. An information flyer with accompanying letter was prepared and distributed in person (preferably), or by mail if the land owner/occupier could not be contacted. The Proponents undertook to meet with all the surrounding neighbours over two days between 7th and 8th October 2015. A summary of the consultation activities undertaken and feedback obtained is provided in **Table 12**.

Consultation was undertaken with key government agencies as described in **Table 13**. Relevant government stakeholders would be consulted during development of the Rehabilitation and Closure Strategy, to ensure stakeholder buy-in and that regulatory requirements are met.

6.19.3. Planning

A quarry plan may be considered a living document subject to change due factors such as policy/legislation; geological and geotechnical properties; market demand; local industry development (e.g. mining, viticulture, equine); community development; and improvements in technology.

The Rehabilitation and Closure Strategy would be developed and updated as required over the life of the quarry to achieve the following objectives:

- protect the environment and public health and safety by using safe and responsible closure practices;
- reduce or eliminate environmental effects once the mine ceases operations;
- maintain conditions which are consistent with the regional land uses; and
- reduce the need for long-term monitoring and maintenance by establishing effective physical and chemical stability of disturbed areas.

A review process would be developed in the Rehabilitation and Closure Strategy.

6.19.4. Financial Provision

Review and periodic updating of a cost estimate for closure and rehabilitation is essential so that unexpected costs do not arise at the beginning of quarry closure. The Rehabilitation and Closure Strategy would provide a cost estimate for progressive rehabilitation and final closure activities, as well as for any relevant environmental monitoring and long-term site management. The strategy would include a mechanism for periodic review of the rehabilitation and closure cost estimate.

The closure and rehabilitation cost would be estimated using a recognised methodology such as the Department of Resources and Energy calculation spreadsheet.

6.19.5. Implementation

To be effective, resourcing and implementing of a rehabilitation and closure plan needs to be clearly identified including roles, responsibilities and resources. This will increase the likelihood of appropriate implementation of a closure plan.

Any on-going management and monitoring requirements after closure would be assessed and adequately provided for in the Rehabilitation and Closure Strategy including a schedule of actions, responsibilities, resources and timeframes.

6.19.6. Rehabilitation Objectives and Standards

An appropriate set of indicators and criteria need to be established that can demonstrate the successful completion of rehabilitation and closure. Completion criteria are an agreed set of environmental indicators which, upon being met, will demonstrate successful rehabilitation of a site. Completion criteria are specific to the quarry being closed, and reflect the unique set of environmental, social and economic circumstances of the site.

A concept plan view and sections of the anticipated final landform are detailed in the Extraction Operations Plan (**Appendix G**) and illustrated in **Figure 8**.

The final landform includes a closed void with a gently sloping quarry floor and benched quarry faces. The key objective would be to establish a stable landform that minimises risks to human and fauna safety and the environment.

The proposed final quarry batter faces would remain at a slope of 0.5 horizontal : 1 vertical. The height of these final faces would require review as the quarry develops, in conjunction with the Mines Safety Inspectorate. It is unlikely that the faces will have any vegetation on them as they will not be visible to neighbours, and the roots of plants can over time destabilise the stratum and make the faces unsafe.

The quarry floor and/or benches would be rehabilitated if required to suppress dust.

Progressive rehabilitation of disturbed areas would be undertaken where appropriate, for example areas that are disturbed temporarily during construction but not required for operations. The rehabilitation plan would aim to return the pre-quarry environmental conditions where possible, which may include establishment of native vegetation or grassland suitable for agricultural purposes.

Vegetated safety berms and fencing would be established along the perimeter of the final benched quarry void.

Clean water diversion drains would be maintained above the final quarry void to divert and drain upslope runoff safely and in a non-erosive manner around the final quarry void. Drain channels and outfalls would be stabilised to prevent scour and erosion in accordance with the Blue Book.

The proposed approach to the rehabilitation of targeted areas would be in accordance with the Blue Book and include techniques such as:

- Ripping surfaces of the processing area and any disturbed lands to be rehabilitated to a depth of 250 mm to key in topsoil;
- Spreading the topsoil stripped from the site prior to the quarry operations commencing to form a minimum 100mm deep layer;
- Seeding with the preferred plant mix;
- Watering, fertilising and maintaining vegetation as necessary to ensure successful establishment; and
- Maintaining sediment and erosion controls until the site is stable.

A detailed checklist of requirements for mine closure is found in Appendix B of the Extraction Operations Plan (**Appendix G**) and would be used to assist in the development of the Rehabilitation and Closure Strategy.

6.19.7. Relinquishment

As there is no mine lease, no tenement would be required to be relinquished. The refund of any security bond, if applicable, would require the rehabilitation to be satisfactory to the DP&E. Relevant records would be kept by Upper Hunter Holdings Pty Ltd to facilitate any future land use planning of the site. Types of records to be kept would include:

- geological records, including cores or core logs;
- plans and surveys of developments and facilities;
- extraction and production records;
- locations, quantities and qualities of any stockpiles of products or overburden;
- site specific surveys or studies; and
- design and specifications of final landform construction and rehabilitation.

6.19.8. Mitigation Measures

The rehabilitation and closure mitigation measures for the Project are summarised in **Table 72**.

Table 72 Rehabilitation Closure Mitigation Measures

Measure No.	Mitigation measure
L1	A Rehabilitation and Closure Strategy would be developed and implemented for the site having regard to the key principles in the Strategic Framework for Mine Closure (ANZMEC, 2000). The timing for development of the rehabilitation Strategy would be within 5 years of planned quarry closure, at a time when the particular geotechnical and water management aspects relevant to closure would be better understood.
L2	Clean water diversion drains would be established and maintained above the final quarry void to divert and drain upslope runoff safely and in a non-erosive manner around the final quarry void in accordance with the Blue Book.
L3	Rehabilitation would be undertaken progressively where appropriate in accordance with the Blue Book.
L4	Fencing would be established along the perimeter of the final benched quarry void.

7. Management Measures

7.1. Introduction

Throughout this report, a number of management measures have been identified in order to minimise adverse environmental, social and economic impacts that could potentially arise from the Project. These management measures would be implemented during the construction and operation of the Project. The identified management measures will be incorporated into contractual arrangements with the future contractors.

7.2. Consolidated Summary of Mitigation Measures

Management measures outlined in this document would be incorporated into the construction and operation of the Project. These management measures would minimise any potential adverse impacts arising from the Project on the surrounding environment. The management measures are summarised in **Table 73**.

Table 73 Summary of Management and Mitigation Measures

Measure No.	Mitigation measure
General	
G1	A Construction Environmental Management Plan (CEMP) would be prepared prior to commencement of construction works and implemented to manage the potential environmental impacts during construction. The CEMP shall include relevant management and mitigation measures identified in the EIS.
G2	An Operational Environmental Management Plan (OEMP) would be prepared prior to commencement of operations and implemented to manage the potential environmental impacts of quarry operations. The OEMP shall include relevant management and mitigation measures identified in the EIS.
G3	A contact phone number will be provided to neighbours so that they may contact the operator if they have concerns over noise emissions or other matters.
G4	A suitable complaints handling procedure will be developed and implemented for the operation of the quarry.
Biodiversity	
FF1	The quarry footprint would be located away from the prominent rocky ridgeline which contains the largest area of intact native vegetation on the property and is considered to contain the most important native fauna habitat.
FF2	A weed management strategy would be developed prior to the construction of the quarry.
FF3	An appropriate feral animal control strategy will be developed prior to the commencement of the construction of the quarry
FF4	A tree felling procedure would be implemented to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of hollow-bearing trees.
FF5	All personnel who will capture/handle/house and/or transport native fauna species (injured or uninjured) will be appropriately licensed under the requirements of the NSW Animal Ethics Committee.
FF6	Site personnel (particularly vehicle operators) will be briefed on fauna awareness issues and will be required to report incidents involving injury to native wildlife
FF7	Assistance from a wildlife carer or veterinarian will be sought if injured native wildlife are encountered.
FF8	A Biodiversity Offset Strategy would be developed to address the impacts of the Project

FF9	A Biodiversity Offset Management Plan (BOMP) for the proposed biodiversity offset area will be prepared following approval of the Project to detail the planned improvements and its ongoing management for biodiversity conservation and enhancement purposes. The BOMP will outline monitoring requirements to assess the adequacy of the impact management strategies at the site.
Air Quality	
A1	Air quality management and mitigation measures will be outlined in an Operational Environmental Management Plan for the quarry.
A2	Activities to be reviewed during adverse weather conditions and modified as required to prevent or minimise dust generation.
A3	Visually monitor dust generation during construction and operation and modify activities or controls where excessive dust generation is observed.
A4	<p>Manage construction and operational activities to minimise generation of dust and air emissions and employ reasonable and feasible air emissions controls, such as:</p> <ul style="list-style-type: none"> • Covering vehicle loads containing dusty materials when travelling offsite • Implement watering or suitable alternative controls to minimise dust generation on haul roads, stockpiles and processing areas • Maintain and service vehicles according to manufacturer's specifications • Switch off engines of vehicles and plant when not in use • Clean sealed haul roads regularly to reduce dust generation and tracking • Reduced disturbed areas exposed to wind erosion by staging quarry operations and minimising the time and area of forward stripping, and undertaking progressive rehabilitation where practicable
Noise & Vibration	
N1	Operational and construction working hours would be restricted to 7 am and 6 pm (Monday to Friday) and 8 am and 1 pm (Saturdays).
N2	All site workers (including subcontractors and temporary workforce) would be made aware of the potential for noise and vibration impacts upon local residents and encouraged to take practical, feasible and reasonable measures to minimise noise during the course of their activities.
N3	The operator would establish suitable means for contacting and engaging with the local residents and will give prior notice of planned blasting activities.
N4	Noise monitoring would be undertaken and reported as specified in the EPL requirements.
N5	A contact phone number will be provided to neighbours so that they may contact the operator if they have concerns over noise emissions or other matters.
Blasting	

B1	Blasting will be undertaken between the hours of 9am to 5pm Monday to Saturday with no blasting on Sundays or public holidays.
B2	All blast monitoring will be undertaken as per the requirements specified in <i>AS 2187.2 - Australian Standard Explosives - Storage and Use</i>
B3	Monitoring will be undertaken if required in accordance with the conditions of the EPL.
B4	Blasting will not take place more than once per day except if a misfire occurs and as this is a safety issue may require a second blast to refire the misfired portion of the blast on the same day.
B5	A blasting management plan would be developed that includes the following: <ul style="list-style-type: none"> • Conditions from the EPL • Measures from the blast assessment; • Management measures for ground vibration management; • Management measures for blast induced air overpressure risk mitigation; and • Consultation with potentially affected sensitive receivers.
Surface Water	
SW1	A detailed soil and water management plan (SWMP) would be prepared following development approval (in line with existing operational plans). The SWMP would be prepared in accordance with relevant best practice guidelines, in particular <i>Managing Urban Stormwater: Soils and Construction, Volume 1</i> (Landcom, 2004) (the “Blue Book”) and <i>Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and Quarries (DECC, 2008)</i> .
SW2	Clean water diversion drains would be established to catch and convey clean surface water around the quarry and discharge this as overland flow into undisturbed areas below the Project area. Drains would be designed in accordance with the Blue Book.
SW3	Dirty water runoff from operation areas would be diverted to suitably sized sediment traps or basins, designed in accordance with the Blue Book, with captured water reused in quarry operations.
SW4	Managed discharges of any surplus water captured within the quarry site would be undertaken in line with EPL conditions. Discharged water quality would be equal to or better than: <ul style="list-style-type: none"> • 50 mg/L Total Suspended Solids (TSS) • No visual oil and grease; and • pH between 6.5 and 8.5.
SW5	A Discharge Procedure would be developed to describe the operational procedures for managed water discharges, including water quality targets, treatment procedures to achieve these targets and monitoring methods to demonstrate compliance
SW6	An erosion and sediment control plan (PESCP) would be prepared for construction of the haul road
Groundwater	

GW1	<p>A groundwater management plan shall be prepared and included as part of the Operational Environmental Management Plan. This will include details for required protection measures including::</p> <ul style="list-style-type: none"> • Containment of any chemicals and fuels in lined bunded areas that are designed to safely accommodate the volume of the stored material; • Onsite sewage management to be undertaken in a manner that does not impact groundwater; and • Containment of truck wash water and processing water such that they can be processed and re-used and not contaminate groundwater. • Groundwater monitoring plan
GW2	<p>Monitor groundwater levels and quality in BH5, BH7 and BH8 twice per year. Results would be tabulated and reported in a working document with comparison to previous monitoring results. Groundwater would be tested for pH, Conductivity, Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAH).</p>
Aboriginal Heritage	
AH1	<p>The persons responsible for the management of onsite works will ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010, under the National Parks and Wildlife Act 1974.</p>
AH2	<p>Prior to the commencement of construction activities that will impact on sites DQ1 to DQ5, the Proponent shall provide for an appropriately qualified archaeological heritage consultant and registered Aboriginal stakeholders to collect any surface artefacts which would be affected by the construction of the SSD. The artefacts shall be lodged in a keeping place to be determined through consultation with the Aboriginal community.</p>
AH3	<p>In the event that unexpected Aboriginal objects are uncovered, all works likely to affect the objects shall cease and the OEH and of DoPI shall be notified of the find. Works shall not recommence until such time that the significance of the finds has been determined and management measures have been developed and implemented by an appropriately qualified archaeological heritage consultant, in consultation with registered Aboriginal stakeholders, and to the satisfaction of the Director-General.</p>
AH4	<p>A Heritage Management Plan (HMP) will be developed in consultation with the registered Aboriginal stakeholders, the proponent and OEH and will detail how construction impacts on Aboriginal heritage will be minimised and managed. The HMP will include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> • Identification of Aboriginal objects directly and indirectly affected by the SSD; • Details of management measures to be carried out in relation to Aboriginal heritage, including a detailed methodology for the community collection of all artefacts associated with the SSD; • Procedures for dealing with previously unidentified Aboriginal objects, or an unexpected finds procedure, (excluding human remains) including cessation of works in the vicinity, assessment of the significance of the item(s), determination of appropriate mitigation measures by a suitably qualified archaeologist in consultation with the of DoPI, OEH and registered Aboriginal

	<p>stakeholders, procedure for determining when works can re- commence, and assessment of the consistency of any new Aboriginal heritage impacts against the approved impacts of the SSD, and registering of any new site(s) in the AHIMS database,</p> <ul style="list-style-type: none"> • Details of an appropriate keeping place agreement with local Aboriginal community representatives for any Aboriginal objects salvaged during construction, • Details on the repatriation of any Aboriginal objects salvaged during the project, including location of re-burial and re-burial methods, and • Procedures for managing the discovery of confirmed or potential human remains, including the temporary cessation of works in the vicinity and notification to the NSW Police Force, OEH, the Department and registered Aboriginal stakeholders and not recommencing any works in the area unless authorised by the OEH and/ or the NSW Police Force.
Historic Heritage	
HH1	If an item (or suspected item) of heritage is discovered during construction, all work in the area of the find will cease immediately and an officer from the Heritage branch of OEH would be notified immediately and advice sought for management of the object.
HH2	All site personnel are to receive a site induction that includes information on their responsibilities under the Heritage Act 1977.
Hazards	
H1	<p>A Fire Management Plan would be prepared in consultation with the NSW Rural Fire Service that addresses the following requirements:</p> <ul style="list-style-type: none"> • Contact person / department and contact details; • Objectives of the Fire Management Plan and statement of how the proponent intends to comply with clause 63 (2) and 64 of Part 4 Division 1 of the Rural Fires Act 1997; • Water supply for fire fighting purposes, its location and use by/compatibility with NSW Rural Fire Service Tankers; • Fire fighting capability and preparedness; • Location of fire trails and schedule and description of works for their construction and their continued maintenance; • Details of any proposed boundary fuel breaks or fire breaks; and • Any proposed prescribed burning.
H2	A Bush Fire Emergency Evacuation Plan shall be prepared in accordance with the NSW Rural Fire Service document 'Guide for Developing a Bush Fire Emergency Evacuation Plan'.
H3	All structures associated with the development shall have a minimum 10m Asset Protection Zone (APZ) that shall be maintained as an inner protection area (IPA) as outlined within section 4.1.3 and appendix 5 of Planning for Bush Fire Protection 2006 and the NSW Rural Fire Service's document 'Standards for asset protection zones'.
H4	Spill kits would be maintained on the Project at storage, and refuelling areas. A mobile spill kit would be kept on the site where plant, machinery and equipment is stored and used during quarry operations.

H5	All on-site staff would be informed of the site's Emergency Response Plan procedures to be undertaken on-site as part of their training.
H6	Refuelling of vehicles and plant on the project site would be carried out in the designated and bunded refuelling area.
H7	Bunding would be installed for chemical, lubricants, fuels and oil storage areas in accordance with relevant guidelines and Australian Standards.
Socio-economic	
SE1	A complaints handling procedure and register would be implemented to assist in recording and managing potential conflict with the local community during quarry operations.
Waste	
W1	The CEMP prepared prior to construction of the Project will document waste management strategies and mitigation measures including : <ul style="list-style-type: none"> • Volumes and types of wastes anticipated • system of in-situ classification of waste material in accordance with EPA's Waste Classification Guidelines • storage and treatment of stockpiles and waste • on-site sewage treatment system and management
W2	Waste management strategies and mitigation measures would be communicated to all employees and contractors during site induction, prior to commencing works at the site.
W3	Waste oil, hydraulic and other hazardous materials will be stored in secure containers and kept in bunded and covered area. Hazardous wastes would be transported to a facility that is appropriately licensed to receive and recycle or treat hazardous wastes.
Landscape Rehabilitation and Closure	
L1	A Rehabilitation and Closure Strategy would be developed and implemented for the site having regard to the key principles in the Strategic Framework for Mine Closure (ANZMEC, 2000). The timing for development of the rehabilitation Strategy would be within 5 years of planned quarry closure, at a time when the particular geotechnical and water management aspects relevant to closure would be better understood.
L2	Clean water diversion drains would be established and maintained above the final quarry void to divert and drain upslope runoff safely and in a non-erosive manner around the final quarry void in accordance with the Blue Book.
L3	Rehabilitation would be undertaken progressively where appropriate in accordance with the Blue Book.
L4	Fencing would be established along the perimeter of the final benched quarry void.

8. Conclusion

This chapter provides the justification for the Project taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the project is in the public interest. The project is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the EP&A Regulation 2000.

8.1. Justification for the development

The project, identified as a State Significant Development (SSD) has been subject to an environmental impact assessment under Part 4, Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Division 4.1 provides for development to be declared SSD either by a State Environmental Planning Policy (SEPP) or by order of the Minister. The Minister is generally the consent authority for SSD. This EIS has examined and taken into account all matters affecting or likely to affect the environment by reason of the proposed activity.

The environmental impact assessment that was undertaken concludes that whilst the project would have some impacts on biodiversity, Aboriginal heritage, public amenity and the visual landscape, these impacts are relatively minor. Mitigation measures identified would effectively reduce these to an acceptable level of environmental risk and enable the project to be constructed and operated without impairment to existing or future land uses.

8.2. Benefits of the Project

The Project would provide a substantial public benefit through the provision of a required resource for the construction/mining industries. This resource would contribute to meeting current and projected future demand for such materials associated with the future growth of the Upper Hunter Valley and Newcastle Region. The construction and operation of a small quarry would also increase employment within the Muswellbrook LGA and provide revenue to the State of New South Wales. These economic and social benefits are considered to outweigh the residual environmental impacts identified in this EIS.

8.3. Ecologically Sustainable Development

8.3.1. The Precautionary Principle

The precautionary principle can be expressed as where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. Application of the precautionary principle includes:

- Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- An assessment of the risk-weighted consequences of various options.

This EIS assesses environmental aspects and impacts associated with the Project with the purpose of reducing the risk of serious and permanent impacts on the environment.

There are few alternate uses for the land where the proposed Project would be established. The grazing qualities of this area are limited at best and the rugged nature of the terrain allows for limited alternate uses. The soils of the proposed gravel extraction area are relatively infertile solodic soils. The agronomists report (**Appendix D**) confirms that no prime agricultural land would be affected.

Specialist studies were undertaken to provide accurate information to assist with the evaluation and development of the project including the following:

- Noise;
- Traffic and transport;
- Air quality;
- Biodiversity (flora and fauna);
- Blasting;
- Aboriginal heritage;
- Non-Aboriginal heritage;
- Agricultural capability;
- Greenhouse gases;
- Soils and surface water management; and
- Groundwater.

8.3.2. Intergenerational Equity

The intergenerational equity principle maintains that people and society must consider the natural and cultural environment of the Earth in common both with the present generation and with past and future generations. This is to ensure that the current generation conserves the natural and built capital so that well-being and productivity are not compromised for future generations.

Although the Project Area does not support a significant amount of natural assets (limited agricultural value and limited native vegetation cover), a Biodiversity Offset program has been proposed to offset environmental impacts from native vegetation clearance to safeguard and conserve areas for future generations.

A soil and water concept plan has been proposed to manage stormwater and water quality and to assess and mitigate potential impacts on the downstream drainage systems such as Wybong Creek and the Goulburn River and limit impacts on these drainage systems.

In addition, the Project would provide construction material for future development in the Hunter Region. Should the Project not proceed future generations could inherit a higher cost of materials which may need to be transported from further afield.

8.3.3. Conservation of Biological Diversity

Ecologically Sustainable Development mandates that the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making, including in the formulation, adoption and implementation of any economic and other development plan, program or project.

Biological diversity means the diversity of life and comprises:

- Genetic diversity (the variety of genes in any population)
- Species diversity (the variety of species)
- Ecosystem diversity (the variety of communities and ecosystems).

A comprehensive assessment of the existing local environment has been undertaken in order to recognise and manage any potential impacts of the project on local biodiversity.

The Project would remove 7.4 hectares of Central Hunter Grey Box – Ironbark Woodland, an Endangered Ecological Community which is also woodland habitat for threatened woodland birds and micro-bats including known habitat for grey-crowned babbler (*Pomatostomus temporalis temporalis*) and speckled warbler (*Chthonicola sagittata*).

The Project would also remove seven pine donkey orchids (*Diuris tricolor*), listed as Vulnerable under the TSC Act, and disturb 22.2 hectares of known and potential habitat for the pine donkey orchid.

However, an assessment of significance concluded that the Project is not likely to result in a substantial impact on species diversity in the wider study area as the higher quality, in-tact

communities - associated with the eastern escarpment areas and the lower slopes in the north - will not be directly impacted as a result of the Project.

The OEH holds that the biodiversity impacts of the Project can be assessed using either the BioBanking Assessment Methodology (Scenario 1) or a detailed biodiversity assessment (Scenario 2). Following consultation with OEH, the Biodiversity Offset Strategy has been prepared in accordance with Scenario 2, being guided by an informal assessment under the newly released (October 2014) Framework for Biodiversity Assessment (FBA) for major projects.

The project is not considered to significantly impact on biological diversity or ecological integrity. An ecological assessment and appropriate site-specific safeguards are provided in Section 6.2 and are further detailed in **Appendix K**.

8.3.4. Valuation and pricing of Resources

This principle requires that environmental costs are incorporated or internalised in terms of the overall costs to the Project.

This EIS assesses the environmental impacts of the Project and identifies measures to minimise, prevent and offset possible impacts. Implementation of these mitigation measures would result in an economic cost to UHH.

Implementing the proposed mitigation measures would increase both the capital and operating costs of the Project. This indicates that environmental resources have been valued in economic terms during the planning and development phase of this project.

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Appendix A

Secretary's Environmental Assessment Requirements (SEARs)

Appendix B

Table Summarising where SEARs are Addressed in the EIS

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
NSW Department of Planning and Environment– State Significant Development (SSD) 6519	
<p>The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.</p> <p>In particular, the EIS must include:</p>	
<p>A full description of the development, including:</p> <ul style="list-style-type: none"> - the resource to be extracted, demonstrating efficient resource recovery within environmental constraints, and having regard to NSW Trade and Investment's requirements (see Attachment 2); - the site layout and extraction plan; - processing activities; - a waste (overburden, leachate, etc.) management strategy, dealing with the EPA's requirements (see Attachment 2); - a water management strategy, dealing with the EPA's and Department of Primary Industries' requirements (see Attachment 2); - a rehabilitation strategy, having regard to the key principles in the Strategic Framework for Mine Closure; and - the likely interactions between the development and any other existing, approved or proposed extractive industry development in the vicinity of the site (such as the Mangoola mine); 	<p>Section 3</p> <p>Section 3</p> <p>Section 3</p> <p>Section 6.17</p> <p>Section 6.19</p>
A list of any approvals that must be obtained before the development commences;	Section 4.1
<p>An assessment of the likely impacts of the development on the environment, including:</p> <ul style="list-style-type: none"> - a description of the existing environment likely to be affected by the development, using sufficient baseline data; - an assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant laws, environmental planning instruments, guidelines, policies, plans and industry codes of practice; - a description of the measures that would be implemented to mitigate and/or offset the likely impacts of the development, and an assessment of: 	Section 6

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> ○ whether these measures are consistent with industry best practice, and represent the full range of reasonable and feasible mitigation measures that could be implemented; ○ the likely effectiveness of these measures; and ○ whether contingency plans would be necessary to manage any residual risks; and ○ a description of the measures that would be implemented to monitor and report on the environmental performance of the development if it is approved; 	
<p>A consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS;</p>	Section 7
<p>Consideration of the development against all the relevant planning instruments (including Part 3 of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries (2007)); and ;</p>	Section 4
<p>The reasons why the development should be approved having regard for biophysical economic and social considerations, including the principles of ecologically sustainable development.</p> <p>While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development.</p>	Section 8.3
<p>In addition to the matters set out in Schedule 1 of the Environmental Planning and Assessment Regulation 2000, The development application must be accompanied by a signed report from a suitably qualified expert that includes an accurate estimate of the:</p> <ul style="list-style-type: none"> - Capital investment value (as defined in Clause 3 of the Environmental Planning and Assessment Regulation 2000) of the development. Including details of all assumptions and component from which the capital investment value calculation is derived; and - Jobs that would be created during each stage of the development. 	Provided separately
<p>The EIS must address the following specific matters:</p> <p>Air – including</p> <ul style="list-style-type: none"> - An assessment of the likely air quality impacts of the development in accordance with the <i>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW</i> and the EPA's additional requirements; 	Section 0 Section 6.18

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - assessment of the likely greenhouse gas emissions of the development, dealing with the EPA's requirements; 	Appendix L
<p>Noise – including</p> <ul style="list-style-type: none"> - an assessment of the likely operational noise impacts of the development in accordance with the NSW Industrial Noise Policy (INP) particular attention to the obligations in Chapters 8 and 9 of the policy; - if a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline; and - an assessment of the likely road noise impacts of the development under the NSW Road Noise Policy; 	<p>Section 6.4</p> <p>Appendix M</p>
<p>Blasting – including</p> <ul style="list-style-type: none"> - proposed hours, frequency and methods; and - an assessment of the likely blasting impacts of the development on people, animals, buildings and infrastructure and significant natural features having regard to the relevant ANZECC guidelines; 	<p>Section 6.5</p> <p>Appendix G</p>
<p>Water – including</p> <ul style="list-style-type: none"> - an assessment of the likely impacts of the development on the quantity and quality of the region's surface and groundwater resources, having regard to the EPA's and Department of Primary Industries' requirements (see Attachment 2); and - an assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users; 	Section 6.6
<p>Land – including</p> <ul style="list-style-type: none"> - an assessment of the likely impacts of the development on the soils, land capability; - and assessment of the likely impact of the development on landforms (topography), paying particular attention to the long term geotechnical stability of any new landforms (such as overburden dumps); and 	<p>Section 6.9 & 6.10</p> <p>Appendix G</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - an assessment of the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements in Clause 12 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007; 	Sections 6.10, 6.15 & 4.5.2
<p>Biodiversity – including</p> <ul style="list-style-type: none"> - an assessment of the likely biodiversity impacts of the Project, having regard to OEH's and DPI's requirements (see Attachment 2); - an offset strategy to ensure the development maintains and improves the biodiversity values of the region in the medium to long term; 	Section 6.2 & Appendix K
<p>Heritage – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, having regard to OEH's requirements (see Attachment 2);</p>	Sections 6.11, 6.12 & Appendix O
<p>Visual – including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, paying particular attention to the creation of any new landforms (noise bunds, etc.);</p>	Section 6.13
<p>Hazards – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, handling and use of any dangerous goods; and</p>	Section 0
<p>Social and Economic – including an assessment of the likely economic and social impacts of the development.</p>	Section 6.15
<p>During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, Aboriginal Stakeholders, community groups and affected landowners.</p> <p>The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.</p>	Section 5
<p>Muswellbrook Shire Council</p>	
<p>Traffic and Transport</p> <p>Full analysis of proposed road routes to all potential customers and the relevant restriction imposed on those customer's Project approval conditions be</p>	Section 0 & Appendix P

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
considered.	
<p>Cumulative impacts with Mangoola Mine</p> <p>Any noise assessment should be fully integrated with the mining operation noise assessment.</p>	<p>Section 6.4.3.5</p> <p>Appendix M</p>
<p>The air quality assessment should include the Mangoola air quality analysis.</p>	<p>Section 6.3.5</p> <p>Appendix L</p>
<p>Biodiversity</p> <p>The <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 Section 79C (1)(a)(i)</i> requires the consideration of any environmental planning instrument including the Muswellbrook LEP.</p>	<p>Section 4.7</p>
<p>MLEP 2009 cl 7.1 Terrestrial biodiversity, applies to this proposal and must be considered.</p> <p><i>(3) Development consent must not be granted for development on land to which this clause applies unless the consent authority is satisfied that the development satisfies the objective of this clause and:</i></p> <p><i>(a) the development is designed and will be located and managed to avoid any potential adverse environmental impact, or</i></p> <p><i>(b) if a potential adverse environmental impact cannot be avoided, the development:</i></p> <p><i>(i) is designed and located so as to have minimum adverse impact, and</i></p> <p><i>(ii) incorporates effective measures to remedy or mitigate any adverse impact caused.</i></p>	<p>Section 6.2</p> <p>Section 6</p> <p>Appendix K</p>
<p>In addition, the area of biodiversity that is proposed to be disturbed by this proposal has been significantly by the Mangoola Coal Project. Therefore any further disturbance to this patch should be avoided if at all possible.</p>	<p>Section 6.2</p>
<p>NSW Office of Water</p>	
<p>It is recommended that the EIS be required to include:</p>	

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - A detailed assessment against the NSW Aquifer Interference Policy (2012) using the NSW Office of Water's assessment framework. - Details of water proposed to be taken (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan. - Assessment of any water licensing requirements (including those for ongoing water take following completion of the Project). - The identification of an adequate and secure water supply for the life of the Project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased. - Assessment of impacts on surface and ground water sources(both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts. - Proposed surface and groundwater monitoring activities and methodologies. - Full technical details and data of all surface and groundwater modelling, and an independent peer review. - A detailed and consolidated site water balance. - Proposed management and disposal of produced or incidental water. - Details surrounding the final landform of the site, including final void management (where relevant) and rehabilitation measures. - Assessment of any potential cumulative impacts on water resources, and any proposed options to manage cumulative impacts. - Consideration of relevant policies and guidelines. - A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table). 	<p>Appendix N Section 0</p> <p>Section 6.7 & 0</p> <p>Section 6.7</p> <p>Section 6.2.4, 6.6, 6.7 & 0</p> <p>Section 6.6 & 0</p> <p>Section 6.6 & 0</p> <p>Section 6.7</p> <p>Section 6.6 & 6.7</p> <p>Section 6.19</p> <p>Section 6.6, 6.7 & 0</p> <p>Section 4 and References This Table Appendix N</p>
<p>Groundwater</p> <ul style="list-style-type: none"> - The predicted highest groundwater table at the site. 	<p>Section 0</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - Works likely to intercept, connect with or infiltrate the groundwater sources. - Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes (Office of Water "GW" registration numbers and licence/approval numbers should be supplied). - A description of the flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources). - Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations. - The predicted impacts of any final landform on the groundwater regime. - The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts. - An assessment of the quality of the groundwater for the local groundwater catchment. - An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal). - Measures proposed to protect groundwater quality, both in the short and long term. - Measures for preventing groundwater pollution so that remediation is not required. - Protective measures for any groundwater dependent ecosystems (GDEs). - Proposed methods of the disposal of waste water and approval from the relevant authority. - The results of any models or predictive tools used. - Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent; <p>Where potential impacts are identified the assessment will need to identify limits to-the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:</p>	<p>Appendix N</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - Any proposed monitoring programs, including water levels and quality data. - Reporting procedures for any monitoring program including mechanism for transfer of information. - An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal. - Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category). - Description of the remedial measures or contingency plans proposed. - Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period. 	
<p>Surface Water Assessment</p> <p>The predictive assessment of the impact of the proposed project on surface water sources should include the following:</p> <ul style="list-style-type: none"> - Identification of all surface water sources including watercourses and wetlands transacted by or adjacent to the proposed project. - Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent downstream licensed water users. - Assessment of predicted impacts on the following: <ul style="list-style-type: none"> o flow of surface water, sediment movement, channel stability, and hydraulic regime, o water quality, o dependent ecosystems, o existing surface water users, and o planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans. 	<p>Section 6.6, 6.7 & Section 6.2.4</p>
<p>Water Sharing Plans</p>	

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<p>Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.</p> <ul style="list-style-type: none"> - Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures. - Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including: <ul style="list-style-type: none"> o Sufficient market depth to acquire the necessary entitlements for each water source. o Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP. o Daily and long-term access rules. o Account management and carryover provisions. - Provide a detailed and consolidated site water balance. 	Section 6.7
<p>Licensing Requirements</p> <p>The EIS is required to provide:</p> <ul style="list-style-type: none"> - Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site- such as evaporative loss from open voids or inflows). - Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water. - Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc). - Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and 	Section 6.7

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<p>proposed water supply works which take surface water, (pumps, dams, diversions, etc).</p> <ul style="list-style-type: none"> - Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing. - Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages. - Details on the location, purpose, size and capacity of any new proposed dams/storages. - Applicability of any exemptions under the Water Management (General) Regulation 2011 to the project. <p>Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.</p> <p>The Harvestable Right gives landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.</p>	<p>Section 6.7.5</p>
<p>Groundwater Dependent Ecosystems</p> <p>The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GOEs) at the site and in the vicinity of the site and:</p> <ul style="list-style-type: none"> - Identify any potential impacts on GOEs as a result of the proposal including: <ul style="list-style-type: none"> o the effect of the proposal on the recharge to groundwater systems; o the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and o the effect on the function of GOEs (habitat, groundwater levels, connectivity). - Provide safeguard measures for any GOEs. 	<p>Section 6.2.4</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<p>Watercourse and Riparian Land</p> <p>The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:</p> <ul style="list-style-type: none"> - Scaled plans showing the location of: <ul style="list-style-type: none"> o watercourses and top of bank; o riparian corridor widths to be established along the creeks; o existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed); o the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and o proposed location of any asset protection zones. - Photographs of the watercourses. - A detailed description of all potential impacts on the watercourses/riparian land. - A description of the design features and measures to be incorporated to mitigate potential impacts. - Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains. 	<p>Section 6.6</p> <p>Section 6.6</p> <p>Figure 14</p> <p>Appendix C</p>
<p>Dam Safety</p> <p>Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.</p> <p>See www.damsafety.nsw.gov.au for further information.</p>	<p>Section 4.4</p>
<p>Drill Pad, Well and Access Road Construction</p>	<p>Section 3.9</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - Any construction activity within 40m of a watercourse, should be designed by a suitably qualified person, consistent with the NSW Guidelines for Controlled Activities (July 2012). - Construction of all wells must be undertaken by a driller holding a water drillers' licence valid in New South Wales. - The length of time that a core hole is maintained as an open hole should be minimised. 	Appendix J
<p>Landform rehabilitation or final void management</p> <p>The Environmental Impact Statement report should include:</p> <ul style="list-style-type: none"> - Justification of the proposed final landform with regard to its impact on local and regional groundwater systems; - A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape; - Detailed modelling of potential . groundwater volume, flow and quality impacts of the presence of an inundated final void on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent; - A detailed description of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and - The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project. 	<p>Section 6.19</p> <p>Section 6.6</p> <p>Section 6.19</p> <p>Section 6.19</p>
Crown Lands	
<ul style="list-style-type: none"> - Prior to preparation of the EIS it is recommended that the proponent undertake a Crown Land Status search available through Crown Lands. 	Section 4.4
<ul style="list-style-type: none"> - The EIS should take into account the objects and regulatory requirements of the Water Act 1912 (WA 1912) and Water Management Act 2000 (WMA 2000), and associated regulations and instruments, as applicable. 	Section 4.4
NSW Trade and Investment – Resources & Energy	
Mineral Resources Issues	
Gravel is not a prescribed mineral under the Mining Act, 1992. Therefore, DTIRIS – Mineral Resources Branch has no statutory role in authorising or	Section 3,

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<p>regulating the extraction of this commodity, apart from its role under the Work Health & Safety Act 2011 and associated regulations and the Mine Health and Safety Act 2004 and associated regulations, for ensuring the safe operation of mines and quarries.</p> <ul style="list-style-type: none"> - All environmental reports (EISs or similar) accompanying Development Applications for extractive industry lodged under the Environmental Planning & Assessment Act 1979 should include a resource assessment (as detailed in Attachment A) which: <ul style="list-style-type: none"> o Documents the size and quality of the resource and demonstrates that both have been adequately assessed; and o Documents the methods used to assess the resource and its suitability for the intended applications. - Applications to modify, expand, extend or intensify an existing consent that has already been adequately reported using the above protocol in publicly available documents, may restrict detailed documentation to the additional resources to be used, if accompanied by a summary of past resource assessments and of past production. - In order to assist in the collection of construction material production data, the proponent should be required to provide annual production data for the subject site to DTIRIS – Mineral Resources Branch as a condition of any new or amended development consent. 	Appendix E
<p>Agricultural Issues for Extractive Industries (Quarries)</p> <ul style="list-style-type: none"> - The relevant agricultural issues to consider are set out in the Departments' Guideline: Agricultural issues for Extractive Industries available on our website; http://www.dpi.nsw.gov.au/environment/landuse-planning/agriculture/extractiveindustries - The guideline also documents recommended Project design and mitigatory responses. 	Section 6.10 Appendix D
<p>Resource Assessment</p> <ul style="list-style-type: none"> - A summary of the regional and local geology including information on the stratigraphic unit or units within which the resource is located. - The amount of material to be extracted and the method or methods used to determine the size of the resource (e.g. drilling, trenching, geophysical methods). Plans and cross-sections summarising this data, at a standard scale, showing location of drillholes and/or trenches, and the area proposed for extraction, should be included in the EA or EIS. Relevant supporting documentation such as drill logs should be included or appended. Major resource proposals should be subject to extensive drilling programs to identify the nature and extent of the resource. - Characteristics of the material or materials to be produced: 	Appendix E Appendix F

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> ○ For structural clay/shale extraction proposals, ceramic properties such as plasticity, drying characteristics (e.g. dry green strength, linear drying shrinkage), and firing characteristics (e.g. shrinkage, water absorption, fired colour) should be described. ○ For sand extraction proposals, properties such as composition, grainsize, grading, clay content and contaminants should be indicated. The inclusion of indicative grading curves for all anticipated products as well as the overall deposit is recommended. ○ For hard rock aggregate proposals, information should be provided on properties such as grainsize and mineralogy, nature and extent of weathering or alteration, and amount and type of deleterious minerals, if any. ○ For other proposals, properties relevant to the range of intended uses for the particular material should be indicated. 	
<p>Details of tests carried out to determine the characteristics of the material should be included or appended. Such tests should be undertaken by NATA registered testing laboratories.</p>	
<ul style="list-style-type: none"> - An assessment of the quality of the material and its suitability for the anticipated range of applications should be given. 	
<ul style="list-style-type: none"> - The amount of material anticipated to be produced annually should be indicated. If the proposal includes a staged extraction sequence, details of the staging sequence needs to be provided. The intended life of the operation should be indicated. 	Section 3
<ul style="list-style-type: none"> - If the proposal is an extension to an existing operation, details of history and past production should be provided. 	
<ul style="list-style-type: none"> - An assessment of alternative sources to the proposal and the availability of these sources. The impact of not proceeding with the proposal should be addressed. 	
<ul style="list-style-type: none"> - Justification for the proposal in terms of the local and, if appropriate, the regional context. 	
<ul style="list-style-type: none"> - Information on the location and size of markets to be supplied from the site. 	Section 0
<ul style="list-style-type: none"> - Route(s) used to transport quarry products to market. 	Section 6.17
<ul style="list-style-type: none"> - Disposal of waste products and the location and size of stockpiles. 	Section 6.4
<ul style="list-style-type: none"> - Assessment of noise, vibration, dust and visual impacts, and proposed measures to minimise these impacts. 	Section 6.19
<ul style="list-style-type: none"> - Proposed rehabilitation procedures during, and after completion of, extraction operations, and proposed final use of site. 	Section 8.3

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - Assessment of the ecological sustainability of the proposal. 	
<p>Health and Safety Issues</p> <p>In relation to the health & safety of mining and quarrying operations, the following issues should be addressed:</p> <ul style="list-style-type: none"> - All operations are to comply with the following Acts & Regulations <ul style="list-style-type: none"> o <i>Work Health & Safety Act 2011</i> o <i>Work Health & Safety Regulations 2011</i> o <i>Mine Health & Safety Act 2004</i> o <i>Mine Health & Safety Regulations 2007</i> - The mine holder must nominate the mine operator in writing on the prescribed form to the Chief Inspector as required by the Mine Health & Safety Act 2004 Section 22 prior to the commencement of extraction. - The operator of the mine must appoint a production manager as required by the Mine Health & Safety Regulation 2007 Clause 16 and the operator must notify the Chief Inspector of the appointment in writing as required by the Mine Health & Safety Regulation 2007 Clause 18 prior to the commencement of extraction. - Any blasting operations carried out by the mine operator must comply with the Explosives Act 2003 and the Explosives Regulations 2005. 	Section 4.8.2
<p>General Requirements – Aquatic Habitat Protection</p> <ul style="list-style-type: none"> - Area which may be affected either directly or indirectly by the development or activity should be identified and shown on an appropriately scaled map (1:25000) and aerial photographs. - All waterbodies and waterways within the proposed area of development are to be identified. - Description and maps of aquatic vegetation, snags, gravel beds and any other protected, threatened or dominant habitats should be presented. Description should include area, density and species composition. - A survey of fish species should be carried out and results included. Existing data should be used only if collected less than 5 years previously. 	Section 6.2.4

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - Identification of recognised recreational and commercial fishing grounds, aquaculture farms and/or other waterways users. - Details of the location of all component parts of the proposal, including any auxiliary infrastructure, timetable for construction of the proposal with details of various phases of construction. - Aspects of the management of the proposal, both during construction and after completion, which relate to impact minimisation and site rehabilitation (e.g. Environment Management Plans, Rehabilitation Plans, Compensatory offsets). - For each freshwater body identified on the plan, the plan should include, either by annotation or by an accompanying table, hydrological and stream morphology information such as: flow characteristics, including any seasonal variations, bed substrate, and bed width. - For each marine or estuarine area identified on the plan, the plan should include, either by annotation or by an accompanying table, hydrological and stream morphology information such as: tidal characteristics, bed substrate, and depth contours 	
NSW Environment Protection Authority	
<p>General</p> <p>The objectives of the proposal should be clearly stated and refer to:</p> <ul style="list-style-type: none"> - the size and type of the operation; - The nature of the processes and the products, by-products and wastes produced; - The use or disposal of products; - the anticipated level of performance in meeting required environmental standards and cleaner production principles; - the staging and timing of the proposal; and - the proposal's relationship to any other industry or facility. <p>The EA will need to fully identify all of the processes and activities intended for the site over the life of the development. This will include details of:</p> <ul style="list-style-type: none"> - The location of the proposed facility and details of the surrounding environment; 	Section 3

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - The proposed layout of the site; - Appropriate landuse zoning; - Ownership details of any residence and/or land likely to be affected by the proposed facility; - Maps/diagrams showing the location of residences and properties likely to be affected and other industrial developments, conservation areas, wetlands, etc in the locality that may be affected by the facility; - All equipment proposed for use at the site; - Chemicals, including fuel, used on the site and proposed methods for their transportation, storage, use and emergency management;Waste generation and disposal; - Methods to mitigate any expected environmental impacts of the development; - Site rehabilitation following termination of the development 	
<p>Air Quality – See Report by Todoroski Air Sciences Pty Ltd</p>	<p>Section 0 Appendix L</p>
<p>Greenhouse Gas</p> <ul style="list-style-type: none"> - The EA should include a comprehensive assessment of, and report on, the project's predicted greenhouse gas emissions (tCO₂e). Emissions should be reported broken down by: <ul style="list-style-type: none"> o direct emissions (scope 1 as defined by the Greenhouse Gas Protocol- see reference below). o indirect emissions from electricity (scope 2), and o upstream and downstream emissions (scope 3) <p>before and after implementation of the project, including annual emissions for each year of the project (construction, operation and decommissioning).</p> <ul style="list-style-type: none"> - The EA should include an estimate of the greenhouse emissions intensity (per unit of production). 	<p>Section 6.18</p>

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<ul style="list-style-type: none"> - Emissions intensity should be compared with best practice if possible. - The emissions should be estimated using an appropriate methodology, in accordance with NSW, Australian and international guidelines (see below). - The proponent should also evaluate and report on the feasibility of measures to reduce greenhouse gas emissions associated with the project. This could include a consideration of energy efficiency opportunities or undertaking an energy use audit for the site. 	
<p>Noise and Vibration</p> <p>Environmental Assessment is to be undertaken according to the following guidelines (when relevant):</p> <ul style="list-style-type: none"> - <i>Interim Construction Noise Guideline</i> (OECC, 2009) - <i>Assessing Vibration: a technical guideline</i> (DEC, 2006) - If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines contained in Australian and New Zealand Environment Council- Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990) - <i>NSW Industrial Noise Policy</i> (EPA, 2000) and <i>Industrial Noise Policy Application Notes</i>. In particular, the acceptability of residual noise impacts (noise above the Project Specific Noise Levels) should be assessed in accordance with Chapters 8 and 9 of the Industrial Noise Policy. - <i>Environmental Criteria for Road Traffic Noise</i> (EPA, 1999) - <i>Environmental Criteria for Road Traffic Noise</i> (EPA, 1999) - <i>Rail Infrastructure Noise Guideline</i> (EPA, 2013) - Noise from increased rail traffic on the NSW Rail Network resulting from rail traffic generating development (e.g. an extractive industry) should be assessed using the environmental assessment requirements for rail traffic-generating developments available at http://www.epa.nsw.gov.au/noise/railnoise.htm 	<p>Section 6.4</p> <p>Appendix M</p> <p>Appendix G</p>
<p>Waste, chemicals and hazardous materials and radiation</p> <p>The EA should:</p>	

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<ul style="list-style-type: none"> ▪ Bunds (earth, hay, mulch) ▪ Geofabric liners ▪ Other control measures as appropriate <p>The Proponent should also provide details of:</p> <ul style="list-style-type: none"> ▪ how leachate from stockpiled waste material will be kept separate from stormwater runoff; ▪ treatment of leachate through a wastewater treatment plant (if applicable); and ▪ any proposed transport and disposal of leachate off-site. <ul style="list-style-type: none"> - Provide details of how the waste will be handled and managed during transport to a lawful facility. If the waste possesses hazardous characteristics, the Proponent must provide details of how the waste will be treated or immobilised to render it suitable for transport and disposal. - Include details of all procedures and protocols to be implemented to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment. - Include a statement demonstrating that the Proponent is aware of EPA's requirements with respect to notification and tracking of waste. - Include a statement demonstrating that the Proponent is aware of the relevant legislative requirements for disposal of the waste, including any relevant Resource Recovery Exemptions, as gazetted by EPA from time to time. - Outline contingency plans for any event that affects operations at the site that may result in environmental harm, including: excessive stockpiling of waste, volume of leachate generated exceeds the storage capacity available on-site etc. 	
<p>Soil</p> <p>The EA should include:</p> <ul style="list-style-type: none"> - An assessment of potential impacts on soil and land resources should be undertaken. The nature and extent of any significant impacts should be identified. Particular attention should be given to: <ul style="list-style-type: none"> ○ Soil erosion and sediment transport - in accordance with <i>Managing urban stormwater: soils and construction</i>, vol. 1 (Landcom 2004) 	Section 6.6

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<p>and vol. 2 (E. Mines and quarries) (DECC 2008).</p> <ul style="list-style-type: none"> ○ Mass movement (landslides)- in accordance with <i>Landslide risk management</i> guidelines presented in Australian Geomechanics Society (2007). ○ Urban and regional salinity- guidance given in the Local Government Salinity Initiative booklets which includes <i>Site Investigations for Urban Salinity</i> (DLWC, 2002). <ul style="list-style-type: none"> - A description of the mitigation and management options that will be used to prevent, control, abate or minimise identified soil and land resource impacts associated with the project. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented. - Where required, add any specific assessment requirements relevant to the project. 	
<p>Water</p> <p>Describe Proposal</p> <ul style="list-style-type: none"> - Describe the proposal including position of any intakes and discharges, volumes, water quality and frequency of all water discharges. - Demonstrate that all practical options to avoid discharge have been implemented and environmental impact minimised where discharge is necessary. - Where relevant include a water balance for the development including water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options. <p>Background Conditions</p> <ul style="list-style-type: none"> - Describe existing surface and groundwater quality. An assessment needs to be undertaken for any water resource likely to be affected by the proposal. - State the Water Quality Objectives for the receiving waters relevant to the proposal. These refer to the community's agreed environmental values and human uses endorsed by the NSW Government as goals for ambient waters (http://www.environment.nsw.gov.au/ieo/index.htm). Where groundwater may be impacted the assessment should identify appropriate groundwater environmental values. - State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC (2000) Guidelines for Fresh and Marine Water Quality http://www.environment.gov.au/resource/australian-and-new-zealand- 	<p>Section 3</p> <p>Section 6.6</p> <p>Section 6.7</p> <p>Section 0</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<p>guidelines-fresh-and-marine- water-quality-volume-1-guidelines</p> <ul style="list-style-type: none"> - State any locally specific objectives, criteria or targets which have been endorsed by the NSW Government. <p>Impact Assessment</p> <ul style="list-style-type: none"> - Describe the nature and degree of impact that any proposed discharges will have on the receiving environment. - Assess impacts against the relevant ambient water quality outcomes. Demonstrate how the proposal will be designed and operated to: <ul style="list-style-type: none"> o protect the Water Quality Objectives for receiving waters where they are currently being achieved; and o contribute towards achievement of the Water Quality Objectives over time where they are not currently being achieved. - Where a discharge is proposed that includes a mixing zone, the proposal should demonstrate how wastewater discharged to waterways will ensure the ANZECC (2000) water quality criteria for relevant chemical and non-chemical parameters are met at the edge of the initial mixing zone of the discharge, and that any impacts in the initial mixing zone are demonstrated to be reversible. - Assess impacts on groundwater and groundwater dependent ecosystems. - Describe how stormwater will be managed both during and after construction. - Describe in detail any water storage ponds, or basins, proposed to be constructed during the whole operational life. Provide location of the proposed storage(s), estimated volume capacities and expected water quality. - Describe under exactly what circumstances, if any, these storages would be discharged or allowed to overtop, and what the receiving environment for any discharges would be. <p>Monitoring</p> <ul style="list-style-type: none"> - Describe how predicted impacts will be monitored and assessed over time. Including a Trigger Action Response Plan, or similar response management plan, that will be implemented in response to any adverse impacts identified from the activity. This plan is to identify appropriate trigger values for the site and provide appropriate response actions to be implemented if adverse impacts are identified through the monitoring program. - Water quality monitoring should be undertaken in accordance with the Approved Methods for the Sampling and Analysis of Water Pollutant in 	<p>Section 6.6</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
NSW (2004) http://www.epa.nsw.gov.au/resources/legislation/approvedmethods-water.pdf	
<p>Hunter River Salinity Trading Scheme (HRSTS)</p> <ul style="list-style-type: none"> - If a wastewater discharge is proposed it must be justified and it must be demonstrated that controlled discharges can be managed in compliance with the requirements of the HRSTS. - If the discharge is necessary the EA must include a tributary impact assessment that addresses the following: <ul style="list-style-type: none"> o Impact on downstream landholders o Physical and biological impacts o Measures to minimise the impacts of the discharge on downstream landholders, and reduce potential erosion hazards at vulnerable points in the stream bank. - If there is more than one mine discharge to a tributary, the EA must address the collective impacts of the discharge to that tributary. 	<p>Section 6.6.5</p> <p>Section 6.6</p>
<p>Monitoring Programs</p> <ul style="list-style-type: none"> - The EA should include a detailed assessment of any noise, air quality, water quality or waste monitoring required during the construction/development phase and on-going operation of the site to ensure that the development achieves a satisfactory level of environmental performance. The evaluation should include a detailed description of the monitoring locations, sample analysis methods and the level of reporting proposed. 	<p>Section 7</p>
NSW Heritage Council	
<p>The Heritage Division</p> <ul style="list-style-type: none"> - The DGRs require a heritage impact assessment to accompany the Environmental Assessment that addresses the following issues: - The heritage significance of the site and any impacts the development may have upon this significance should be assessed. - This assessment should include natural areas and places of Aboriginal, historic or archaeological significance. It should also include a consideration of wider heritage impacts in the area surrounding the site; 	<p>Section 6.11</p> <p>Section 6.12</p> <p>Appendix O</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - You should consult lists maintained by the Office of Environment & Heritage, the National Trust of Australia (NSW), the Australian Government under the Environment Protection and Biodiversity Conservation Act 1999 and the local council in order to identify any identified items of heritage significance in the area affected by the proposal. Please be aware, however, that these lists are constantly evolving and that items with potential heritage significance may not yet be listed; 	<p>Section 5</p> <p>Section 6.11 & 6.12</p>
<p>Non-Aboriginal Heritage items</p> <ul style="list-style-type: none"> - Non-Aboriginal heritage items within the area affected by the proposal should be identified by field survey. This should include any buildings, works, relics (including relics underwater), gardens, landscapes, views, trees or places of non-Aboriginal heritage significance. A statement of significance and an assessment of the impact of the proposal on the heritage significance of these items should be undertaken. - Any policies/measures to conserve their heritage significance should be identified. This assessment should be undertaken in accordance with the guidelines in the NSW Heritage Manual. The field survey and assessment should be undertaken by a qualified practitioner/consultant with historic sites experience. 	<p>Section 6.12</p>
<ul style="list-style-type: none"> - The DGRs should require the development of an appropriate archaeological assessment methodology, including research design, in consultation with the Heritage Council, to guide physical archaeological test excavations and include the results of these excavations. 	<p>Section 6.12</p>
<p>NSW Local Land Services - Hunter</p>	
<ul style="list-style-type: none"> - The Local Land Services (LLS) would strongly recommend if the proposal is to go ahead and native vegetation is cleared an appropriate offset for this clearing is established and maintained. - This is also important as the area is located in a highly saline catchment. Offsets are established in appropriately can assist in minimising salinity impact of this proposal. 	<p>Section 6.2, 6.6</p>
<ul style="list-style-type: none"> - Hunter-LLS believe the proponent will need to develop an Erosion, Sediment and Rehabilitation Control Plan and a Salinity Management Plan. 	<p>Section 6.6</p>
<ul style="list-style-type: none"> - Investigations of the soil profiles will need to include salinity and fertility information to determine rehabilitation methods and construction techniques for earthworks. The Erosion, Sediment and Rehabilitation Control Plan will need to include design criteria for clean water diversion, dirty water containment structures, haulage roads and stockpiles. A sequential rehabilitation of the site would reduce the impact the proposal will have on the environment by not having large areas exposed at any one time. 	<p>Section 6.6</p>
<ul style="list-style-type: none"> - It has been noted the proponent is seeking to use surface water for utilisation throughout the site including dust suppression. Hunter-LLS 	<p>Section 6.6</p>

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<p>knowledge and salinity investigations in the area has shown a number of dams contain saline water. An assessment of water quality would be required to demonstrate water from these dams are suitable for use on the site and have no accumulative impact on soil and vegetation on the site. The Salinity Management Plan would require investigation, assessment, mitigation works and monitoring program.</p>	
NSW Health	
<ul style="list-style-type: none"> - The Dolwende Quarry SSD Application Supporting Document states that "Potable water for drinking and washing would be supplied by water tanker and roof water tanks". The assessment should, therefore, include comment on issues associated with drinking water quality and rainwater tanks. 	Section 6.7
<ul style="list-style-type: none"> - NSW Health recommends that business or facilities that supply drinking water from an independent water supply (i.e. not town water) follow the NSW Private Water Supply guidelines (2014). The Public Health Act 2010 and the Public Health Regulation 2012 require drinking water suppliers, including private water suppliers, to develop and adhere to a 'quality assurance program' (or drinking water management system) from 1 September 2014. 	Section 4.8.2
<ul style="list-style-type: none"> - NSW Health recommends regular testing of drinking water at facilities with private supply. If a private water supply is contaminated, or is not monitored or not treated then consumers should be warned. - The reference document for rainwater tanks is enHealth's Guidance on use of rainwater tanks (2010). 	Section 4.8.3
NSW Rural Fire Service	
<p>The following key issue and assessment requirements regarding bush fire protection shall be included in the Director-Generals environmental assessment requirements:</p> <ul style="list-style-type: none"> - A Fire Management Plan should be prepared that addresses the following requirements: <ul style="list-style-type: none"> o Contact person / department and contact details. o Objectives of the Fire Management Plan and statement of how the proponent intends to comply with clause 63 (2) and 64 of Part 4 Division 1 of the Rural Fires Act 1997. o Water supply for fire fighting purposes, its location and use by/compatibility with NSW Rural Fire Service Tankers. 	Section 0

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> ○ Fire fighting capability and preparedness. ○ Location of fire trails and schedule and description of works for their construction and their continued maintenance. ○ Details of any proposed boundary fuel breaks or fire breaks. ○ Any proposed prescribed burning. - A Bush Fire Emergency Evacuation Plan shall be prepared in accordance with the NSW Rural Fire Service document 'Guide for Developing a Bush Fire Emergency Evacuation Plan'. - At structures associated with the development shall have a minimum 10m Asset Protection Zone (APZ) that shall be maintained as an inner protection area (IPA) as outlined within section 4.1.3 and appendix 5 of Planning for Bush Fire Protection 2006 and the NSW Rural Fire Service's document 'Standards for asset protection zones'. 	
NSW office of Environment and Heritage	
<p>The proposal</p> <p>The objectives of the proposal should be clearly stated and refer to:</p> <ul style="list-style-type: none"> - The size, scale and type of the activity/development. - All anticipated environmental impacts, both direct and indirect, including level of vegetation/ habitat clearing; - Threatened species, populations, ecological communities and/or habitats impacted upon; - The staging and timing of the proposal; and - The proposal's relationship to any other proposal and/or developments. 	<p>Section 3</p> <p>Section 6</p> <p>Section 6.2</p> <p>Section 3.7</p> <p>Section 2</p>
<p>Aboriginal Cultural Heritage</p> <ul style="list-style-type: none"> - The EIS must address and document the information requirements set out in the 'Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW'. 	<p>Section 6.11 & Appendix O</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
<ul style="list-style-type: none"> - The EIS must include surveys by suitably qualified archaeological and geomorphological consultants in consultation with all of the local Aboriginal knowledge holders. - THE EIS should identify the nature and extent of foreseeable impacts on Aboriginal cultural heritage values across the Project area and clearly articulate strategies proposed to avoid/minimise these impacts. Any impacts should be clearly justified. - EIS must assess and document the archaeological and Aboriginal significance of the Project area's Aboriginal cultural heritage values. - Describe actions taken to mitigate impacts of the Project on Aboriginal heritage values. Any methodologies for Aboriginal cultural heritage investigation should reflect the 'Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (2010)' and the 'Code of Practice for Archaeological Investigations of Objects in NSW (2010)'. - Documentary evidence must be provided to demonstrate effective community consultation with Aboriginal communities. As a guide OEH's 'Aboriginal cultural heritage consultation requirements for proponents 2010'. - If impacts on Aboriginal cultural heritage values are proposed as part of the final development, an assessment of the proposed impacts in the context of 'inter-generational equity' and cumulative impact must be undertaken. This assessment must examine both cultural and archaeological perspectives equally at both the local and regional levels, with consideration given to the site level and broader landscape level. 	
<p>Biodiversity</p> <ul style="list-style-type: none"> - OEH notes that the subject site occurs immediately west of a biodiversity offset for the Bayswater to Mt Piper Electricity Transmission Line Relocation Project and is also partly covered by Glencore's Project Area for biodiversity assessment for the Upper Hunter Strategic Assessment. Therefore the EIS will need to consider its impact of an adjacent biodiversity offset and may also have recent biodiversity survey results associated with the Mangoola Coal Mine Project. - Biodiversity impacts can be assessed using either the BioBanking Assessment Methodology or a typical biodiversity assessment. 	<p>Section 6.2 Appendix K Section 6.2.7</p>
NSW Roads and Maritime Services (RMS)	
<p>Traffic Impact Assessment</p> <ul style="list-style-type: none"> - It is noted that the volumes of traffic likely to be generated by this development are not excessive and a Traffic Impact Assessment (TIA) was undertaken in 2012 by Colston Budd Hunt and Kafes Pty Ltd for a proposed gravel quarry at the subject site. This TIA will be adopted in 	<p>Section 0</p>

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	SECTION
preparing the environmental assessment and appears to be generally satisfactory in addressing the matters of interest to Roads and Maritime. - Muswellbrook Council should be consulted for their requirements.	Appendix P

Appendix C

Site Photographs

Appendix D

Agricultural Assessment

Appendix E

Preliminary Resource Estimate

Appendix F

Geotechnical Investigation Report

Appendix G

Extraction Operations Plan

Appendix H

Blasting Assessment

Appendix I

Survey Plan for Easement Purposes

Appendix J

Haul Road Plans

Appendix K

Ecological Assessment

Appendix L

Air Quality Impact Assessment

Appendix M

Noise and Vibration Impact Assessment

Appendix N

Groundwater Impact Assessment

Appendix O

Aboriginal Heritage Impact Assessment

Appendix P

Traffic Impact Assessment