SMK
CONSULTANTS
surveying – irrigation – environmental - planning
ABN 63 061 919 003

39 Frome Street
PO Box 774
Moree NSW 2400
Ph 02 6752 1021
Fax 02 6752 5070
ptaylor@smk.com.au
Other offices:
Goondiwindi, Gatton,
Miles, Brisbane
www.smk.com

ENVIRONMENTAL IMPACT ASSESSMENT

FOR A PROPOSED INCREASE IN ANNUAL PRODUCTION FROM RUNNYMEDE QUARRY

Lot 52 & 53
DP 751093
Parish of Bullala
County of Burnett

Proponent: Johnstone Concrete and Quarries Pty Ltd
PO Box 941
Moree, NSW 2400

Prepared by: SMK Consultants
Frome Street
Moree NSW 2400

July 2013

SMK Consultants
Document Verification

Document Details: **Proponent: Johnstone Concrete and Quarries Pty Ltd** **Document Title: "Environmental Impact Statement for proposed increase in annual production from Runnymede Quarry"** **Land Details:** Lots 52 and 53 DP 751093	
Report No. 13-43-1	
Prepared for:	Johnstone Concrete and Quarries Pty Ltd PO Box 941 Moree, NSW 2400 Contact: Mitchell Johnstone
Prepared by:	SMK Consultants P.O. Box 774 Moree NSW 2400 Contact: Peter Taylor ptaylor@smk.com.au Ph.02 6752 1021
Authors:	..... Jamie Cowell B. Urb Reg Plan Town Planner ..... Sarah Grady B. Env. Sc. Environmental Consultant
Reviewed by:	..... Peter Taylor B.Sc. MEIANZ SMK Consultants, Moree

Revision History

Revision No.	Date Issued	Reason/Comment
0	14th February 2013	Initial Issue
1	19th June 2013	Updated for Road train use approval

CONTENTS

Executive Summary

Introduction

SMK Consultants was engaged by Johnstone Concrete and Quarries Pty Ltd to prepare an Environmental Impact Statement (EIS) to assess the proposed increase in the annual production limit for their Runnymede Quarry located near Pallamallawa in northwest NSW.

Runnymede Quarry presently operates under two development consents. The first consent was issued by the Yallaroi Shire Council on the 19th of May 1995 and the second on the 20th of October 1995. These development consents permit a combined annual production total of 120,220 tonnes of extractive material per year from the quarry.

Due to increased demand for construction materials, predominantly from the NSW RMS, Councils, ARTC and the regional construction industry, the Proponent is seeking permission to amend these development consents to allow the extraction of up to a maximum of 300,000 tonnes of material in any one year period. This proposal does not seek to change the approved extraction method, processing method or final footprint and rehabilitation outcomes of the quarry.

The EIS describes the project, outlines relevant statutory provisions, identifies the key issues and assesses potential environmental, community interests and responds to comments from government departments.

Project Description

The proponent currently operates a hard rock quarry on the farming property "Runnymede", a 650 hectare grazing property situated approximately 17 kilometres northeast of the village of Pallamallawa. The quarry produces high quality aggregates and road base for rail, road and civil construction in the northwest plains of New South Wales.

Due to the geological development of the northwest region reserves of hard rock suitable for infrastructure development and maintenance are non-existent on the alluvial plains associated with the Namoi, Gwydir, Macintyre, Barwon and Moonie river valleys. Demand for high quality hard rock base material for road and concrete production in the northwest region has resulted in a significant demand from the few active quarries in the region as they are the closest source of basalt based rock. Runnymede quarry has been targeted for reconstruction of public infrastructure such as the Newell, Gwydir and Carnarvon highways, ballast for ARTC works, production of high quality concrete and rural road redevelopment within the Shires of Moree Plains, Gwydir, Walgett, Brewarrina, and Balonne.

The proposal is to increase the extraction and processing rate from 120,220 tonnes per year to 300,000 tonnes per year to satisfy the demands of State and Local Governments as well as private infrastructure projects.

Stakeholder Consultation

A planning focus meeting was held on the 18th of May 2009 between Gwydir Shire Council, DECC&W (now OEH), RTA (now RMS) and SMK for preliminary discussions. Several informal meetings between various parties have been held as requested. A public meeting was held at the Crooble Hall on the 22nd of March, 2010 to discuss operations of the quarry with local residents and seek input. Information, advice and comments from the participants were taken into account in the preparation of this document. The initial discussions identified transport of materials from the site as a major parameter in the ongoing development of the quarry operation. This application has been delayed until a suitable outcome has been reached and works have commenced to resolve this parameter.

Ongoing discussions with State and Federal Political representatives, Gwydir Shire representatives and the proponent has led to an agreement to redevelop a single haul road

between the quarry and Moree Plains Shire to allow the use of road trains to haul quarried product from the quarry in order to reduce the overall potential vehicle numbers associated with the quarry operation. The agreement includes bitumen sealing of this haul road and all trucks servicing the quarry to utilise this one road. The work commenced in early 2013 and approval has been issued by NSW RMS to utilise road trains to transport materials from the quarry.

Environmental and Social Assessment

A number of studies have been undertaken to assess the present and likely impacts from the quarry operation, including impacts on flora and fauna, noise, air quality, traffic, Aboriginal and European heritage and hydrological impacts. The key findings of these studies are summarised below.

Flora and Fauna

The footprint of the quarry will not change nor extend beyond the original boundary of the area identified for extraction of the resource. These boundaries contain previously cultivated farmland which is presently used for grazing. The immediate areas outside the approved quarry footprint have been logged and now contain various densities of regrowth comprising mostly Callitris species. The proposal to increase the annual output from the quarry is not considered to have any additional significant impact on threatened species, populations or ecological communities or their habitats in the area surrounding the site. The original habitat that may have been present on the site prior to clearing and farming is well represented in an adjoining area which now includes the gazetted Bullala National Park.

Noise

Noise modelling has been undertaken for the quarry operation and at the nearest sensitive receiver. The monitoring has demonstrated that due to the design of the quarry and the distance to the nearest sensitive receiver, noise generated by quarry operations is predicted to remain below the project specific noise level. The assessment predicted that the proposed production increase would not impact on the amenity of surrounding landowners or generate unacceptable intrusive noise nuisances.

Air Quality and Dust

Monitoring of deposited dust has been undertaken over an extended period at the quarry and at "Billandrie" homestead on Mosquito Creek Road. Monitoring for PM 2.5 and PM 10 was undertaken at the nearest sensitive receiver ("Kirkton"). The monitoring has demonstrated that deposited dust levels, PM2.5 and PM 10 are below criteria set by the regulating agencies for NSW. Monitoring was carried out in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants NSW guidelines. Predictions of increases that may occur as a result of increased production indicate that dust emissions are predicted to remain within acceptable levels. Appropriate mitigation proposals have been included in the Environmental Management Plan to maintain or reduce dust emission levels from the site once the production increases.

Traffic and Transport

Road transport is the only method of moving the product from the quarry to the end user. The proposed development includes increases in transport efficiencies by utilising road trains in replace of B-Double and single trailer haulage. The use of road trains will increase the capacity of each truck trip by doubling the amount per trip when compared to single semi-trailer loads. The use of road trains in conjunction with minor changes to operating hours over a normal 6-day and occasional 7-day week would result in a similar daily level of truck trips generated from the site and a lower cost for delivery of the materials for projects,

including major government projects in the region. Some additional vehicles would be generated as a result of a minor increase in staff and maintenance requirements.
The use of road trains to service the facility is supported by Council and NSW RMS. Works to upgrade a single haul road between the quarry and Moree Plains Shire boundary commenced in late 2012 and are almost complete. Road train use was approved on the 18th of June 2013. The road works involved in this change will form part of the on-going contribution from the quarry to the local Shire. This change is to be achieved by a variation of an existing agreement that was prepared as part of the original approval process.

Soil and Water
Existing measures used to control soil erosion and the network of drains and sediment dams were assessed and it was determined that with minor adjustment and appropriate ongoing maintenance they would perform adequately for the life of the project.
Water balance calculations for the site indicate that adequate water would be available from natural rainfall for dust control measures during average and above average rainfall years. Once rainfall tends toward a low level, some back-up measures have been assessed including cessation of works due to a limited ability to suppress dust from the site or use of groundwater as a short term measure.

Cultural Heritage
A detailed Aboriginal heritage assessment has been undertaken by Suzanne R Hudson Consulting in conjunction with Local Aboriginal Land Council site officers from Moree, Ashford and Inverell. Following the site inspection it was concluded that:

> *"No Aboriginal objects, sites or places of significance were found during survey of this area and it is the opinion of the site officers present and the archaeologist that the development can proceed".*

A search of the Yallaroi Local Environmental Plan 1991 and the online heritage databases of the NSW Heritage Office failed to discover any records of European heritage on the site, which was confirmed during several site inspections.

Socio-economic Impacts
The Gwydir Shire suffers from some population and economic decline and population ageing. The Shire's major employer is the agriculture although even this sector has shown decline. This project is expected to provide social and economic benefits at both the local and regional level in terms of job creation and the provision of high quality aggregates for use in civil construction, road and rail sectors in the northwest NSW region. A large portion of the new employment and potential contract roles offered at the quarry will be retained within the Gwydir Shire, mainly Warialda.

Visual
The quarry is more than two kilometres from the nearest public road and obscured from view by thick regrowth timber and scrub. The extended quarry area will remain below the skyline that is presently visible. Extension of the annual output would not alter the visual intrusion of this site.

Site Rehabilitation
Only limited site remediation has been undertaken since the commencement of quarry operations as the quarry operation remains in an active state. As the quarry face and pit moves in an easterly direction, part of the disturbed area is used for product stockpiles, parking, manoeuvring and loading operations. Areas not utilised for activity have natural regenerated from an extensive seed base from the surrounding woodland habitat. The proponent will rehabilitate the land once quarry operations are complete and return the disturbed areas to their previous use which was grazing.

1. Introduction

SMK Consultants is acting for Johnstone Concrete and Quarries Pty Ltd (the applicant) to prepare an Environmental Impact Study (EIS). The EIS has been prepared under provisions of the Environmental Planning and Assessment Act 1979 to accompany a development application to the Gwydir Shire Council for project approval to amend the two existing development approvals to permit an **Increase in Annual Production from Runnymede Quarry**.

The EIS describes the project, outlines relevant statutory provisions, identifies the key issues and provides an assessment of potential environmental and community impacts. It also describes a range of management, mitigation and offset measures proposed to ensure that short-term impacts are minimised and that there is a net socio-economic benefit from the proposal.

2. Background

The supply of quality road-building materials in the black soil shires of Moree, Narrabri and other western shires is extremely limited and an increasing number of road and rail upgrading projects, along with mining activity in these shires, has resulted in an increased demand for hard rock product. Johnstone Concrete and Quarries Pty Ltd (ACN 151 466 554) (the proponent) is a family-owned company that operates several quarries and concrete batching plants in the Moree, Warialda and Mungindi areas. These quarries and batching plants are not operated concurrently; rather, they historically operate 'on-demand' with workforce, trucks and machinery being transferred from one location to another as demand dictates. The Runnymede quarry is central to the operation and has operated continuously since construction in 1995 with breaks in production only occurring when annual limits are reached or unsuitable weather conditions prevail.

The company is ISO 9001 endorsed and supplies road-building materials to NSW Roads and Maritime Services (RMS), Australian Rail Track Corporation (ARTC) and its subsidiaries, local government and local industry in its area of operation as well as ready mixed concrete to the construction and mining industry.

The Company received the original development consent for the Runnymede Quarry in early 1995 which enabled the Proponent to develop a hard rock quarry on the grazing property "Runnymede". The initial approval was for the extraction of 20,000 cubic metres (approximately 60,220 tonnes) of hard rock per annum. A second approval issued in October 1995 allowed extraction of a further 60,000 tonnes of hard rock per annum. The second approval was Designated Development under Schedule 3 of the Environmental Planning and Assessment Regulation 1994 and was the subject of an Environmental Impact Assessment.

Both of these approvals are currently active and allow a combined extraction rate of 120,220 tonnes of gravel product per annum.

To be capable of filling large contracts available from the RMS, ARTC, local government, the mining sector and also meeting local demand from private companies, the proponent proposes to increase the potential annual production capacity from its Runnymede operation to 300,000 tonnes per year. The increase will enable the quarry operation to fulfil major contracts such as highway reconstruction works in addition to local continuous work in the region without requesting additional short term approvals to meet one-off type infrastructure development projects, such as the Moree Bypass and redevelopment of the Newell Highway.

The additional production to meet larger supply contracts is within the capacity of the existing quarry plant. When required, the additional production could be achieved through continuous production within the operating hours as proposed. The haulage of this material

aims to utilise the efficiencies of larger truck loads in the form of road trains through an agreed haul route established in conjunction with the Gwydir Shire Council. Use of road trains is predicted to result in a similar number of truck trips to supply the increased production limit as compared to current operations where mostly single trailer trucks or smaller tip trucks and trailers are utilised to haul the gravel from the site.

The total volume of resource applied for under this application is up to 9 million tonnes (1.8 million cubic metres)

In June 2010 the Director General of the Department of Planning provided his requirements for the Environmental Assessment of the proposal. The application was originally lodged under Part 3A of the NSW Environmental Planning and Assessment Act 1979 and the NSW Minister for Planning (the Minister) was to be the consent authority. This process was not pursued due to several parameters, including that this part of the Act is to be repealed in preference to management of such applications on a more local basis. The application has now been revised and prepared for lodgement with Gwydir Shire to be dealt with locally.

3. Stakeholder Consultation

Throughout the EIS process consultation with State Government departments and Gwydir Shire Council, both formally and informally, has aided in refining the proposal and developing the assessment methodology.

Consultation has included:

- Planning Focus meeting/s with NSW OEH, NSW National Parks, Gwydir Shire, NSW DPI (Mines);
- Extensive discussion with Gwydir Shire Council including three separate development applications during the course of the preparation of this EIS
- Onsite and offsite meetings with key agencies to update environmental management of the site, environmental reporting, site operations
- Informal consultation with various government departments to discuss assessment methodology and key findings;
- A public meeting at Crooble to inform local residents of the proposal/s and obtain feedback in regard to topics of concern (roads, dust, noise, Council self-help program for local road construction (gravel available from quarry at cost price)
- Several discussions with local residents concerning dust impact from vehicles using Mosquito Creek Road and use of haul roads
- Discussions with State Minister for Roads and Gwydir Shire with the aim of developing road train access to the quarry
- Discussion with the Moree Plains Shire in relation to haul routes, road impacts, gravel demand and truck size limits

4. Director General's Requirements

The Director-General's requirements for the preparation of this EIS were developed from the issues raised at the planning focus meeting and subsequent agency consultation. The Director-General's requirements are set out in the following section of the EIS and are presented in appendix 1.

4.1 General Requirements

The Environmental Assessment of the project must include:

- an executive summary;
- a detailed description of:

  - existing and approved development on site, including a copy of all statutory approvals that apply to this development; and
  - the existing environmental management and monitoring regime;
- a detailed description of the project, including;
  - the need for the project;
  - alternatives considered;
  - the development to be carried out both onsite, including plans of all the proposed building and extractive works, and offsite, particularly with respect to road works;
  - detailed plans of the proposed rehabilitation of the site, and how this would be integrated with the surrounding land uses; and
  - likely staging of the project.
- a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment;
- a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes:
  - a description of the existing environment, using sufficient baseline data;
  - an assessment of the potential impacts of all stages of the project, including any cumulative impacts, taking into consideration any relevant policies, guidelines, plans and statutory provisions (see below); and
  - a description of the measures that would be implemented to avoid, minimise, mitigate and (if necessary) offset the potential impacts of the project, including detailed contingency plans for managing any significant risks to the environment;
- a statement of commitments, outlining all the proposed environmental management and monitoring measures;
- a conclusion justifying the project on economic, social and environmental grounds, taking into consideration whether the project is consistent with the objects of the Environmental Planning & Assessment Act 1979; and
- a signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.

4.2 Key issues

- **Transport** — including:
  - a detailed assessment of the potential impacts of project related traffic on the safety and efficiency of road networks; and
  - a detailed description of the measures that would be implemented to upgrade and/or maintain these networks over the life of the project;
- **Biodiversity** — including;
  - accurate predictions of any vegetation clearing on site;
  - a detailed assessment of the potential impacts of the project on threatened species or populations and their habitats, ecological endangered communities and groundwater dependent ecosystems;
  - an assessment of edge effects and any impacts resulting from the interaction of the quarry with the management of Bullala National Park; and
  - a detailed description of the measures to maintain or improve the biodiversity values of the surrounding region in the medium to long term;
- **Quarry Closure and Rehabilitation** — including a detailed description of the proposed rehabilitation strategy for the quarry, taking into consideration any relevant strategic land use planning or resource management plans or policies, including future interactions with Bullala National Park;
- **Soil & Water** — including:
  - a site water balance;

  - a detailed description of the proposed water management system;
  - a detailed assessment of the potential surface and groundwater impacts of the project, paying particular attention to potential contamination and water availability impacts on local waterways and water users (including the environment);
- **Noise** — including construction noise, operational noise and off—site road noise impacts;
- **Blasting and Vibration**;
- **Air Quality**;
- **Visual**;
- **Heritage** — including Aboriginal and non-Aboriginal heritage;
- **Waste**;
- **Greenhouse Gas**; and
- **Social & Economic** — including an assessment of the socio—economic impacts of the project, and the demand on local infrastructure and services.

4.3 Project objectives

The objectives of the project are to

- Meet the local and regional demand for the supply of hard rock products;
- Maximise the efficient use of quarry infrastructure and investment through increasing output to match the capacity of existing equipment;
- Conduct operations in an environmentally sensitive and sustainable manner through effective management and mitigation of environmental impacts;
- Contribute to the local and regional economies through provision of employment, capital expenditure and the supply of extractive materials.
- Operate within approved conditions including local development approvals and the environmental protection licence.

5. Site context

Runnymede Quarry is situated on a low ridge on the property "Runnymede" in the Milguy district. The ridge area is located on the western edge of the basalt and sandstone outcrops associated with the New England Tertiary basalts. The property includes an area of approximately 650 hectare of grazing land that is situated approximately 17 kilometres northeast of the village of Pallamallawa, 45 kilometres northeast of Moree and 32 kilometres northwest from Warialda. Local roads connect Runnymede Quarry to the Gwydir Highway, which provides access to Moree, via the village of Pallamallawa. The property is on the eastern edge of the flat plains associated with the Gwydir River.

"Runnymede" has previously been logged for cypress timber and is presently includes areas supporting dense juvenile regrowth cypress. The area that is being quarried had been cleared and cultivated prior to commencement of the quarry operation in 1995. The clearing was undertaken by the previous landowner for crop production including cereals and cattle fodder. At present, the areas that are not subject to quarry operations are grazed by horses and cattle when grass is available.

Runnymede Quarry is surrounded by a relatively dense buffer of woodland including extensive areas of regrowth timber. The quarry is difficult to observe from the surrounding roads as a result of this woodland buffer area. The quarry is accessed by a private road which was developed prior to the gazettal of Bullala National Park. The surrounding park and

properties on the eastern side of Gil Gil creek road remain relatively undeveloped and include extensive areas of cypress and iron bark woodland.

Gil Gil creek road was original developed as a track for access to the forest and some of the local homesteads. The track was widened to provide access for larger machinery such as wheat harvesting equipment and farming plant in the early 80's. The road has subsequently been widened and gravelled for all-weather use since 1995 as part of an existing agreement between Council and the Proponent. The current Council development program and agreement under the existing site approvals includes bitumen sealing of Gil Gil creek road to the turnoff to Runnymede quarry.

The quarry consists of a hard rock pit, two sand extraction pits for manufacture of road base gravel in accordance with RMS specifications, ancillary processing works, stockpile areas, a workshop, diesel fuel storage tanks, weighbridge, office, owner's residence and vehicle parking areas.

6. Existing and approved development on the site

The existing Runnymede quarry on Lots 52 and 53 in DP 751093 operates under two development consents which were issued by Yallaroi Shire Council on the 19th of May and 20th of October, 1995. These development consents allow a total annual extraction of 120,220 tonnes based on a conversion factor (average weight) of approximately 2.8 tonne per cubic metre of rock material. Both of these approvals are currently active and are not time limited, meaning that the estimated 9 million tonnes of material available on the site may be extracted on a continuous basis. Copies of these approvals are attached to this report as Appendix 2.

The second application lodged in 1995 was classified as Integrated Development under the Environmental Planning and Assessment Act 1979 and therefore required an environmental impact statement to obtain the development approval. The quarry is also a scheduled premise under the Protection of the Environment Operation Act 1997. The quarry operates under Environmental Protection Licence (EPL) No. 7379 which was issued on the 25th of June 2000. A copy of the EPL is presented in Appendix 2. The EPL has been modified on several occasions to update operating conditions and requirements for monitoring.

The original development provided blue metal rock for concrete production. This gradually extended to various mixes of blue metals for road construction gravels and grading's of blue metal for specific projects such as rail ballast.

Over the past 5 to 8 years, the quarry has been operating to its maximum approved hours and production limits to meet demand from the RMS and local government clients. This has resulted from the changes in specification for major road construction by organisations such as RMS who has generally moved away from using high plasticity low CBR clayey gravels available within the shortest distance to their infrastructure to a requirement for a designed hard rock road base material with a high CBR and increased longevity. The basalt gravels available at Runnymede quarry meet these specifications and therefore demand for this gravel has substantially increased. The gravel from the quarry is now being transported to western projects located as far as 350 km from the quarry for the reconstruction of major highways and local roads.

The proposed increase in annual production is within the capacity of the existing quarry plant and will achieve economies of scale through more efficient plant utilisation. The increase in annual production would not alter the intended final footprint of the quarry as no increase in area is proposed.

The present method of quarrying, which involves overburden stripping, drilling, blasting, crushing, screening and stockpiling would continue. Stockpiled overburden is retained on site

and would be used in rehabilitating the site once quarrying has ceased. Overburden consists of approximately 1 m to 1.5 m of clayey gravel and loose rock.

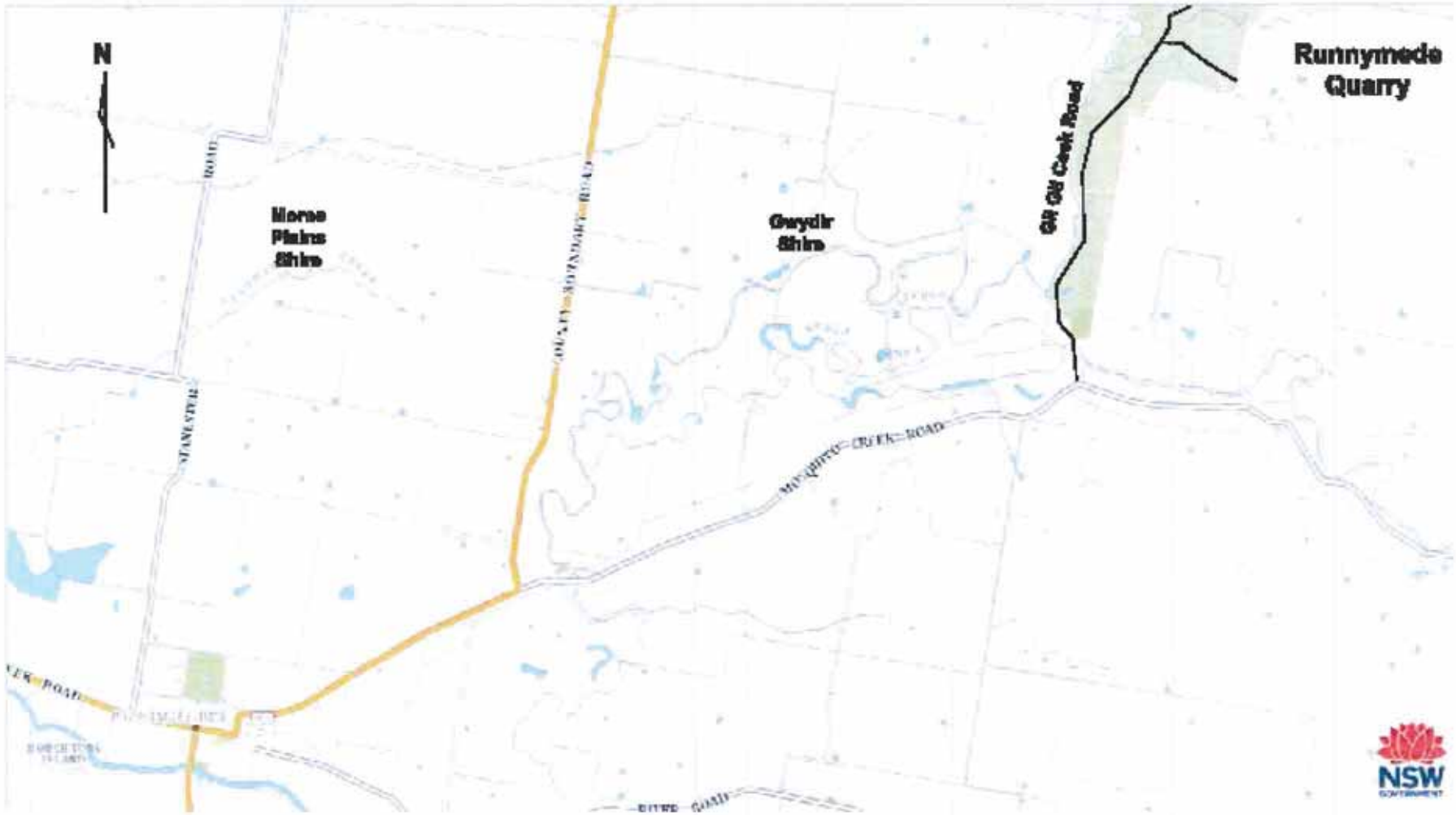
The current agreement between Council and the Proponent includes a description of haul roads and contributions to Council. Council and the Proponent have monitored this agreement since operations began. All matters relating to this agreement have been settled and are now considered up to date. The exception to this is a verbal agreement that the original haul roads leading to the north of the site are not to be used as main haul roads for projects in western Shires. These northern roads are only to be used for local gravel supplies.

A revised agreement has been reached between Council and the Proponent to utilise the southern end of Gil Gil creek road and Mosquito Creek road as the primary haul road from the quarry. Works have commenced on the upgrade of this haul road to enable the use of road trains to and from the quarry. The On the 18th of June 2013, NSW RMS approved the use of "modern road trains operating at general mass limits for several roads within the Gwydir Shire including Mosquito Creek and Gil Gil creek roads. A permit was issued to the Proponent to allow this to occur. Road trains are now in use for haulage of product from the quarry.

7. Project Details and Development Proposal

7.1 Quarry Resource

A locality plan for the quarry site identifying the location of closest village areas is presented as plan 1. More detailed aerial photography showing the quarry boundaries and site details are presented in plan 2. The quarry is located northeast of the town of Pallamallawa in the western part of the Gwydir Shire. The quarry is located in an area of sandstone and basalt outcrops that have a thin layer of topsoil. The area had historically been utilised for light grazing prior to the 80's when the owner cleared and cultivated the crest of the hill for cropping. The Proponent purchased the property and commenced quarrying operations in 1995.


N
Runnymede Quarry
Old Cowk Road
Moree Plains Shire
Gwydir Shire
NSW

A detailed survey was undertaken of the site to identify the existing infrastructure and extents of the basalt resource available. The survey enabled quantification of the gravel resource. The current operating floor level of the quarry is approximately 15 m below the crown of the ridge through which the resource is available. The intention is to continue excavating the quarry at this floor level in an easterly direction. At a depth of 15 m, the area outlined in Plan 2 would provide approximately 3,200,000 m^3 of basalt material for crushing and manufacture of road base material and other products despatched from the quarry.

The area identified on plan 2 consists of land that had been previously cleared of vegetation and farmed for production of cereal crops prior to 1995. The area has been allowed to revegetate with a mixture of saplings and scattered grasses. At present the area is grazed when sufficient grass is available. However, the surface material consists of many bare patches and small rock outcrops.

The resource quality and extent have been confirmed by exploratory drilling. Laboratory testing of materials from the site has confirmed that the material satisfied RMS requirements for construction aggregate and complies with AS 2758.1 Aggregates and rock for engineering purposes – Concrete Aggregates.

The quarry is approximately 300 metres wide by 15 metres deep. The extraction face is moving in an easterly direction with only minor encroachments on the northern and southern sides to provide access around the top of the quarry. The active extraction area is located through the top of the natural ridge of the site. The rock materials to the south and north of the quarry deteriorate to include more extensive sandstone content on the slope of the ridge. This surrounding material is to remain un-touched.

The current eastern boundary of the proposed quarry area consists of an original internal fence line. This fence line formed the limit of the detailed survey. No further investigation had been undertaken to the east of this line; however the remaining ridge area extends to a distance of 1 km or more to the east. The surface material is considered similar to the land that is currently quarried and therefore it is assumed that additional area is available for long-term future extractions if required. This eastern area beyond the fence line has not been investigated in relation to surface detail.

This application involves a maximum annual extraction limit of up to 300,000 tonne per annum. This annual tonnage would allow for large contracts such as road reconstruction, rail redevelopments and other major infrastructure projects to source material from the quarry whilst the quarry operation can continue with regular contracts such as the supply of aggregate for concrete production and the local road network in Moree Plains, the Gwydir Shire and surrounds.

In accordance with State Environmental Planning Policy (State and Regional Development) 2011, the quarry would be classified as a Schedule 1 extractive industry if the total resource included in the application is greater than 5 million tonnes. The intention of this application is to assess the impact of the quarry for removal of up to 5 million tonne once the consent is provided. The Proponent intends to retain the two existing consents issued for the quarry or alternatively (subject to legislation once the threshold of 5 million tonnes is achieved), either reduce the annual extraction limit to the level permitted at present or re-submit an application to continue extraction at a rate of up to 300,000 tonne per year to fully utilise the resource that has been identified.

The Proponent predicts that average annual extraction rate would be in the order of 200,000 to 225,000 tonne. On this basis, the resource would last for a period of potentially 25 years under the new application before a decision is made by the proponent in relation to ongoing extraction rates where the overall limit is 5 million tonne.

On this basis, the proposed development would remain as local development and not state significant development.

In addition to the main hard rock quarry, two sand quarries have been developed to provide clean fines for the preparation of specific road base blends requested by NSW RMS, such as DGB20 which is presently used as the main road base for Newell Highway projects. The sand pits provide a small proportion of the overall gravel component.

Sand pit 1 is located to the immediate southwest of the weighbridge area. This pit consists of a wholly below ground pit constructed to a depth of approximately 2-3m. The pit is surrounded by a low berm to minimise the ingress of surface runoff into the sand extraction area. The pit area is surrounded by saplings that have regrown over the past several years. The area had original been cleared by the previous owner (prior to 1995) and generally utilised for light grazing of cattle.

Sand pit 2 is located north of the main quarry area. This pit consists of a below ground pit used to obtain clean sand for incorporation in the road base mixes of gravel. The pit is located in a previously cleared area; however Cypress pine suckers have regenerated around the pit site. These suckers will remain in place to provide some ground cover until the pit needs to be extended.

The two sand pits offer a local source of fines for blending of the hard rock materials to make road base to specification. Other materials such as lime are imported to the site when required for special projects undertaken by RMS. Alternative sources of fines are available from other pits located in the region that are operated by the Proponent.

7.2 Extraction Method

Hard rock is extracted from the quarry face by firstly drilling a network of holes, placing of charges and blasting the rock away from the wall onto the floor of the pit. This is undertaken by a suitably qualified and licensed contractor. Once the blasted rock is made safe, a mobile primary crusher is walked to the pile of blasted rock and the raw rock is fed to the crusher by an excavator. The primary crushed material is stockpiled within the pit floor and then hauled by dump truck and front end loader to the secondary crushing and sieving plant. The secondary crushing plant consists of a permanent secondary crusher, vibrating sieves to screen and separate the gravel particles and a conveyor system to build separate stockpiles. During the process of secondary crushing production, front end loaders are deployed to stockpile the processed aggregate into separate piles.

The process of crushing rock materials is a high maintenance activity. Plant and equipment is replaced on a regular basis as equipment wears out. Each replaced piece of equipment is upgraded to the most modern and efficient equipment available at the time. It is predicted that within a 5-year period, the primary crusher used within the quarry would be replaced with a crusher that is capable of both primary and secondary crushing. This would consist of mobile plant that would crush the raw rock to a standard suitable for direct despatch from the site or require minor grading through the secondary crushing plant. This single crushing operation will provide materials for concrete production, course road base, rail ballast and other raw rock requirements. If this equipment is utilised, the crushed rock would be stockpiled within the pit area. The external secondary crushing plant would remain in place for finer crushing a materials for road and concrete materials.

The primary crushing equipment is powered by diesel engines as it is mobile equipment. The secondary crushing and sieving process is electrically powered by main electricity

7.3 Gravel Production

Various forms of gravel product are produced on the site. The initial process involves separation of the gravel after crushing into various sizes ranging from the course gravel aggregate suitable for rail ballast to the fine 5 mm aggregate used for asphalt and bitumen construction. Various sized aggregate is produced for use at the concrete manufacture operated by the Proponent's Moree based ready mixed concrete facility and other similar facilities in the region. This rock ranges in size from 5 mm to 12 mm aggregate. The process of crushing and sieving also produces larger quantities of material referred to as "crusher dust'. This is the finer particles and flakes of rock less than 3-5 mm which passes through all of the sieves. This material is extensively used in the construction industry for many purposes. Excessive amounts of this material are generated during the secondary crushing process. At present, this material is utilised as a raw gravel base to provide all-weather access within the pit area. The material is also stockpiled within the batters of the main pit where it could be recovered if required.

A substantial proportion of the quarried material produced on the site is developed for quality road base. This road base is utilised by NSW RMS and surrounding Councils. The Proponent produces road base material to specifications provided by NSW RMS. Some of this road base is manufactured through a

"pug mill" and the remainder is raw material passed through the sieve system. The pug mill is a separate process to the secondary crushing and sieving plant. The mill is specifically designed to mix measured weights of various grades of crushed rock, sand and other fine components such as lime. The process generally includes water to provide the optimum moisture content for the road base material. If water is not applied in the process, it generally means that the gravel has natural moisture obtained from rainfall or soakage with the quarry area. The manufactured road base is specifically designed for use on the Newell highway as a highly stable and hard wearing material used to support the bitumen seal.
The larger rocks that are too big for primary or secondary crushing are also sold as ballast, landscaping material and erosion control rock.

The quarry operation includes a small bitumen coating plant. This plant is utilised to coat 5 mm to 8 mm sized gravel material for mainly local Council use. The plant is located on a lower level adjacent to the workshop and residence. The plant operates on an as needed basis as the product is only suitable for use for a short period after production. The Proponent has a similar plant at their Moree base to service the Moree town and district. The plant is bunded to contain any spillage or soakage of the pre-coat mix. Production of this material is a relatively minor component in the overall production from the site.

7.4 Annual Production

At present the quarry is limited to an annual production of approximately 120,220 tonne of material to be hauled from the quarry per annum under the two Council consents. The EPL allows the production of up to 500,000 tonne of product from the site; however this figure is for administrative purposes only. The Council consent is the lower figure and at present sets the annual limit of extraction of material hauled from the site. Production from the quarry has reached this limit each year for the past 5 to 6 years or more as a result of demand for the high quality hard basalt based road gravel produced on the site. The quarry was originally developed during a period where local gravels were utilised by NSW RMS and Councils. These gravels included various clay based gravels to provide a pavement design for a 20-year life span. Through a process of design and analysis based on costs of reconstruction, NSW RMS determined that the life span calculations for major roads were not appropriate for planned traffic volumes and current and potential load limits. The use of local gravel materials on roads such as the Newell Highway resulted in regular failures of pavement and therefore high costs for maintenance. On this basis, analysis by various authorities has determined that the use of higher quality hard rock based gravel was more suitable to construct main highways to provide a hard wearing surface and stable sub-grade that would not expand and contract as a result of unstable clays. The surface may therefore be less prone to failure allowing a potential reduction in road maintenance costs.

Once this decision was made, quarries such as Runnymede quarry were targeted to supply road base material for highway construction. Such contracts involved large quantities for single contracts such as 50,000 to 80,000 tonne delivered to the Moree bypass road works over an extended period. Contract sizes are increasing as a result of the need to replace larger sections of highways and other major regional roads in order to maintain trafficable roads for larger volumes of trucks and travellers.
Hard rock quarries such as Runnymede are not common in the region and therefore at present, the majority of hard rock road base used in the region is hauled from Runnymede. Alternate sources at present are available from Toowoomba and Inglewood in Qld, Inverell, Narrabri and Gunnedah in NSW. Some other local quarries are available in the Gwydir Shire. These quarries are mostly approved for a maximum annual production of up to 30,000 tonne. Such quarries have mostly been opened up for Council road construction within a 10 to 20 km radius of the quarry and do not include any permanent equipment or daily operations.

The current annual limit at Runnymede restricts the volume available to major capital works projects as Runnymede also supply gravel and other product to local users. The proponent reviewed the potential for supply of road base to the region and considered that some potential exists for one or more contracts in the order of 100,000 to 120,000 tonne per year in addition to the supply of 40,000 to 60,000 tonne of various materials to their normal Moree operations. On this basis, the Proponent has identified an upper production limit of 300,000 tonne should be sufficient to satisfy demand in the region for the next 10-

years or more. This would enable supply of gravel to more than one major infrastructure project each year, several sections of reconstruction for the Newell Highway in addition to specific projects in the Moree and Gwydir Shires if tenders could be won.

The production level of 300,000 tonne per annum is based on an estimated average production of 1,000 tonne per day for a five day week allowing a further 40,000 tonne per annum to be produced on weekends. This includes allowances for wet weather when the quarry ceases production for a period of several days or more after any substantial rain.

Potential daily production would be in the order of 2000 tonne per day for the primary crusher which would enable an internal stockpile of material to be developed. Production at the secondary crusher and sieve plant would be in the order of 1,000 tonne per day on average over the same time scenario as indicated above.

The quarry is predicted to operate at an average of 80 percent of full capacity (an annual average of 225,000 tonne). Production is generally limited from the site to the number of suitable trucks that are available. In this case, an agreement has been established with Gwydir Shire to allow the use of road trains to haul gravel from the site. This would enable each load to be increased from an average of 25 tonne to an average of 50 tonne. On this basis, production could potentially double with a similar number of truck trips to and from the site.

Despatch from the site would aim for an average of 960 tonne per day based on a 6-day week for the despatch of the maximum limit of 300,000 tonne per annum. Alternatively, at 80 percent of annual potential despatch, the average daily despatch would be in the order of 720 tonnes. This would generate between 17 to 23 gravel trucks consisting of a predicted 75 percent road trains and the remainder carried by various combinations such as B-doubles, truck and dog trailers with some single semi-trailers. The daily limit is set by the time it takes to receive, load and despatch a truck. At present this is in the order of 30-minutes unless there is no queue in place and it may be reduced to 20-minutes. Physical restrictions are based on load times and processing of each truck over the weighbridge. It is anticipated that at full production, approximately 23 trucks could be despatched over a period of 9.5 hours. Further loading efficiencies will be possible once the use of road trains is completely adopted for the site.

The daily limit of despatch from the quarry will also be controlled by the impact of site operations in relation to noise and other environmental issues. The operations must work within the established noise and air quality criteria in order to meet company responsibilities as outlined in the attached environmental management plan and state guidelines related to environmental impact.

7.5 Operating Hours

The following table 1 presents a description of the various operations of the quarry and the proposed operating hours. The current operating hours are restricted under the EPL and are from 7am to 5.30pm Monday to Friday with no operations to occur outside of these hours or on weekends or public holidays. The Proponent has identified these hours as restrictive to production and site operations. The operating hours at present do not allow any activity on the site outside of these hours. This includes maintenance and repair of equipment. If a breakdown occurs, the repairs must be undertaken between these hours to avoid any breaches of the EPL and potential fines or cautions. On occasions, a large breakdown of the processing equipment would mean several days of repair and no production on the site. This generally leads to a significantly busy period of truck despatches when the machinery returns to operation. The impact of such busy periods may potentially cause impacts from the frequency of truck traffic on local roads. Management aims to avoid such issues and therefore have considered widening their operating times to enable production to continue throughout the week to meet all commitments at a relatively constant schedule of operation whilst limiting potential impacts from the operation.

An application has been lodged with Gwydir Council to extend the existing operating hours. The application had been partially dealt with at the time of this application to extend the overall production

limit at the quarry. The extension of operating hour application had included an agreement to modify the Environment Protection Licence.

The following table presents the proposed operating hours. The various activities conducted as part of the whole site operation have been separated to enable greater definition of operations and related times for operation based on potential impacts and potential mitigation measures that are available to the proponent.

Table 1: Proposed Operating Hours at Runnymede Quarry and description of potential impacts.

Activity	Proposed Hours of Operation	Limitations, Potential Impacts
Arrival and dispatch of trucks to haul aggregate or deliver products (Lime, fuel, equipment, etc)	7.00 am to 5.30 pm Monday to Friday including loading of trucks from 6.30 am and dispatch of trucks that arrive prior to 5.30 pm. 7.00 am to 2.00 pm Saturday including loading and dispatch of trucks arriving prior to 2.00 pm. 8.00 am to 2.00 pm Sunday, including loading and dispatch of trucks arriving prior to 2.00 pm. No hauling on public holidays. No loaded aggregate truck to leave site after 6.00 pm or 3.00 pm, respectively.	Trucks arrive by public road – No restrictions on use of public road, however impacts consist of potential noise and dust en-route to and from the site.
Employees, residents and light service vehicles	No restriction on light vehicles	Public road access is available to all vehicles. Minimal impact from small vehicles.
Maintenance on plant and equipment including workshop activity, repairs/alterations to processing equipment	6 am to 10 pm Monday to Friday, 7am to 6 pm Saturday, Sunday and public holidays.	Does not include operation of crushing plant with material. Limited to repairs and ***unloaded*** test runs. Potential impacts considered as minor as work would generate minimal noise and dust from light vehicles only.
Operation of primary-crushers and associated equipment within the walls of the quarry.	6.00am to 6.00 pm Monday to Friday, 7.00 am to 5.00 pm Saturday, 8.00 am to 2.00pm Sunday and Public holidays	Noise emissions are buffered within confines of excavated area to disperse noise within site or vertically. No equipment to operate with line of site to residences on adjoining properties.
Operation of secondary crushers, sieves, separators, blending, pug-mill, and conveyors located on outside of quarry confines	7 am to 6 pm Monday to Friday, 7 am to 5 pm Saturday. 8 am to 2 pm Sundays and Public holidays.	Noise and dust emissions could potentially disperse across neighbouring properties
Operation of loaders, excavators, trucks, pre-coating equipment within lower storage yard area	6 am to 10 pm Monday to Friday, 7am to 6 pm Saturday, Sunday and public holidays.	Noise to be confined within stockpile and shed barriers. Area to be watered under dry conditions. Noise would consist of loader only.
Drilling	7 am to 6 pm Monday to Friday, 7 am to 5 pm Saturday. 8 am to 2 pm Sundays and Public holidays.	Low noise impact, minimal dust impact
Blasting	9 am to 4 pm Monday to Friday in accordance with State guidelines	High potential impact of noise, dust and vibration
Exceptional circumstances (1)	24-hours Monday to Saturday and Sunday when instructed by relevant authority (NSW RMS, Council, ARTC)	For manufacture and delivery to RTA, ARTC or Shire projects only. Limited to use of four (4) trucks.

(1) **Definition:**
Exceptional Circumstances – To include emergency works as requested by NSW RMS or Shire Councils. Projects within western Shires including Gwydir, Moree Plains, Narrabri, Walgett, Brewarrina, Bourke, Balonne and Narromine
Purpose: To enable delivery of materials to western areas and delivery of materials under emergency conditions (eg. Maintaining access in flood conditions, wet weather repair of highways and main roads)

The proposed hours of operation intend to allow some flexibility in relation to the arrival of trucks on the site including some minor allowances if trucks arrive on the site at or close to closing time. Issues occur on a regular basis where a truck arrives on the site and is delayed due to a mechanical fault. Previously the truck had to be unloaded prior to departure. The proposal would allow some flexibility

during peaks periods to ensure empty trucks are not normally despatched from the site. Experience on the site suggests that this may save 4 to 6 truck trips per week.

Normal operations would extend from Monday to Saturday. The main issue of potential impacts has been identified as haulage trucks. On this basis, operating times for Saturday and Sunday have been limited to align closely with noise emission criteria for NSW. Late starts would occur on Saturdays and Sundays. Haulage operations would cease by no later than 3 pm on weekends allowing for trucks that arrive prior to 2 pm to be loaded and despatched within the selected operating hours.

Assessment of site operations such as crushing and sieving has indicated that noise emissions meet acceptable criteria under NSW Guidelines. The potential hours of operation for these activities have therefore been extended in the above table 1 to provide additional flexibility for the site.

The more specialised operations such as blasting will be restricted to current limits as such operations are controlled by guidelines outside of the environmental management plan.

The quarry enterprise has expanded markets to the west of Moree where truck turnaround time can be in the order of 6-8 hours from the quarry to the construction site and return to the quarry. Such trips generally involve the use of road trains to minimise haulage costs and when available larger truck sizes will be utilised (e.g. B-triples). The intention of quarry management is to allow 2-3 trips per day for such contracts and therefore table 1 proposes to include the use of these trucks over a 24-hour period. The intention is to restrict the number of trucks to 4-units being 4-road trains. This would require a minimum of 8-drivers in total for the 12-hours shifts. The trucks would spend approximately 30-minutes at the quarry to load and fuel up between trips. Restricting truck numbers to four trucks only for these operations has been determined as a suitable management mechanism to avoid excess noise impact through more sensitive areas on the haul road such as Pallamallawa when only limited other trucks are utilising the road network. During harvest periods in the district, the addition of 3 to 4 truck trips through the night period would have little or no additional impact as the regions roads are busy with haulage of farm produce.

The proposed operating times would be managed in accordance with the environmental management plan. The plan includes criteria relating to environmental impacts such as dust and noise generated at the quarry.

A special operating clause has been included to allow for emergency operations outside of the stated operating hours. This clause has been included to allow the quarry to supply road base materials under special conditions that have resulted from flooding or severe weather events. Such events generally include extensive rain and therefore gravel pits located on the floodplain area are generally inaccessible. If an authority such as NSW RMS, Council or ARTC wishes to undertake repair work to damaged infrastructure, they have in the past 12-months waited until production and delivery can occur from Runnymede quarry. The restrictions in operating times at the quarry has caused some issues and delays in repairs to major transport routes including the Newell Highway and the Moree-Werris Creek rail line. The above table 1 presents an option to overcome this issue by allowing the quarry to operate under emergency conditions. Such conditions would require the consent of EPA and/or Gwydir Shire.

7.6 Stockpiles

Three stockpile areas are managed on the site. The primary stockpile is located within the floor of the quarry. It consists of raw material and primary crushed material obtained from the quarry face. The current primary crusher equipment processes larger rock into 5 – 100 mm aggregate size, ready for secondary crushing and screening.

Primary crushed aggregate is hauled and fed directly into the secondary crusher and sieve plant. No primary crushed material is stockpiled outside of the quarry floor. The secondary crusher and sieve plant are capable of separating the quarry material into multiple grades. The secondary stockpile area is located around the immediate surrounds of this crusher plant. The material is moved around and loaded onto trucks by a front end loader.

The third stockpile area is located across the lower level of the quarry and adjacent to the residence and workshop area. The material stockpiled on this area consists of more specialised products that are not produced in similar quantities to road base materials. The lower stockpile provides longer term storage. This stockpile area is also used for preparation of pre-coated aggregate for bitumen road construction.

7.7 Weighbridge

All transport vehicles entering and leaving the quarry pass over a weighbridge which ensures that an accurate weight of product received and despatched is held. During busy periods, the weighbridge requires a dedicated operator. During quieter periods, the weighbridge is operated by each truck driver. The weighbridge is calibrated regularly as weights from the site are used as part of delivery dockets to authorities such as NSW RMS.

7.8 Workshop

A well-equipped workshop is located on-site which ensures that all machinery is able to be maintained in a safe and efficient operating condition. The workshop is located on the lower stockpile area. The workshop is utilised to service machinery that remains onsite such as loaders, a dump truck, excavators, water truck and other associated vehicles. On occasion the workshop facilities are utilised to change tyres or undertake minor repairs on the trucks hauling gravel from the quarry.

The workshop operates on an as needed basis and does not employ a full-time mechanic.

7.9 Plant and storage areas

Mobile quarry plant not in use is stored in a bunded area to the north of the workshop. Major spare part components are also located in this area so that they are readily available in the case of a breakdown.

7.10 Diesel fuel storage

Diesel fuel used for quarrying operations is stored in three bunded steel tanks to the west of the owner's residence. Fuel can be obtained direct from the tanks for mobile equipment. Fuel is also transferred to mobile fuel trailers to haul fuel to less mobile equipment such as excavators and the primary crushers.

7.11 Roads and access

The main haul route from the quarry is now confirmed to include the following roads through the Gwydir Shire:

- Gil Gil Creek Road between the Quarry and Mosquito Creek Road
- Mosquito Creek road between Gil Gil Creek road and Moree Plains Shire

The original development consents issued by Council enabled utilisation of other haul roads within the Gwydir Shire as part of an agreement to upgrade sections of road for quarry use. However, the use of some of these other roads became an issue raised by local residents in relation to requests to Council to improve the standard of many roads in the northwest sector of the Shire. The residents objected to the standard of the roads for their use by trucks hauling either farm produce or on occasion, gravel.

Council is presently seeking additional public funding and offering agreements for self-help programs to upgrade various local roads. The Proponent no longer utilises these smaller roads for haulage unless local contracts obtained to deliver gravel to Council or private works require the use of these roads due to an absence of alternatives.

Several public meetings and meetings with the Gwydir Council and the region's political representatives were held to resolve the issue of haul roads. These discussions included an option for construction of a private access road directly west from the site through private property. However this option was considered too difficult due to the requirement to cross through Bullala National Park due to gazettal issues that have not been resolved for the park.

After extensive discussions with Council, the matter has been agreed upon to enable settlement of a haul road issue as an ongoing cause of concern to Shire residents, Councillors and the Proponent. Council is presently upgrading Mosquito Creek and Gil Gil Creek roads to a bitumen sealed standard. These two roads leading to the quarry from Moree Plains Shire are now approved for road train use. The approval is presented in appendix 3.

Road train use is permitted throughout Moree Plains Shire. The main haul road from the Gwydir Shire would then continue through Moree Plains Shire to Moree. Figure 1 presents an aerial photo of the main haul route between the Proponent's Moree depot and the quarry.

The haul roads were discussed with senior staff in Moree Plains Council. As the roads are already used by road trains and intense periods of road train use associated with farm harvest periods, Moree Plains Council advised that the use of road trains within the Moree Plains area is permissible and would not incur any specific requirements.

Once through Pallamallawa, the trucks will utilise the Gwydir Highway through to Moree. This is a state funded road. The road is open to all trucks up to the size of a road train at present.

At present, the road connection between Gil Gil Creek road and the quarry boundary traverses through Bullala Forest. The road was originally constructed under an agreement with NSW State Forests in 1995. Discussion with NSW National Parks and Wildlife Service has indicated that this agreement remains satisfactory. However, it should be noted that the gazettal of Gil Gil creek road through the park has not been completed. The road remains separate from the park but has not been formally created. This is the responsibility of NSW National Parks and Wildlife Service and will be undertaken when budgets allow.

Figure 1: Haul Routes comprising local roads, state roads & private roads

The road connection between Gil Gil creek road and the quarry has been gravelled using the road base materials and maintained to a suitable standard for gravel truck operation. The following figure 2 presents are photograph of this road and the surrounding park area. The road has been cleared to the minimum extent.

Figure 2: Internal access road - Runnymede Quarry

The following photographs illustrate the existing roads to be upgraded as the main haul route. Figure 3 presents a view of Gil Gil creek road at the entrance to the quarry. .

Figure 3: Gil Gil Creek Road looking south from quarry entrance

A single lane concrete causeway (Figure 4) forms the crossing over Mosquito Creek on Gil Gil creek road. The creek is an ephemeral stream and on occasions floods. Such flooding does not normally impact quarry operations as the quarry closes for an extended period after rain due to the high moisture content of the aggregate making it impossible to process. This causeway is the subject of an upgrade to be undertaken by Gwydir Shire. Designs have been prepared and work has commenced. The upgrade will be undertaken to enable the safe passage of road trains across this causeway.

Figure 4: Causeway over Mosquito Creek, Gil Gil Creek Road

Mosquito Creek Road from its intersection with Gil Gil Creek Road comprises a two lane gravel formation for its 8.4 kilometre length to the edge of Moree Plains Shire. A typical section of this road is presented in the following figure 5. This road is being bitumen sealed in July 2013 (pending weather).

Figure 5 Mosquito Creek Road between Gil Gil Creek and County Boundary Roads

Once the haul route enters the Moree Plains Shire, the road is bitumen sealed. The County Boundary Road runs north-south along the boundary between Moree Plains and Gwydir Shires. This is a primary arterial road servicing a large farming area. This road is mostly bitumen sealed apart from a short length around the Crooble turnoff. Mosquito Creek Road is bitumen sealed west from its intersection with County Boundary Road. This road is approved for road train use.

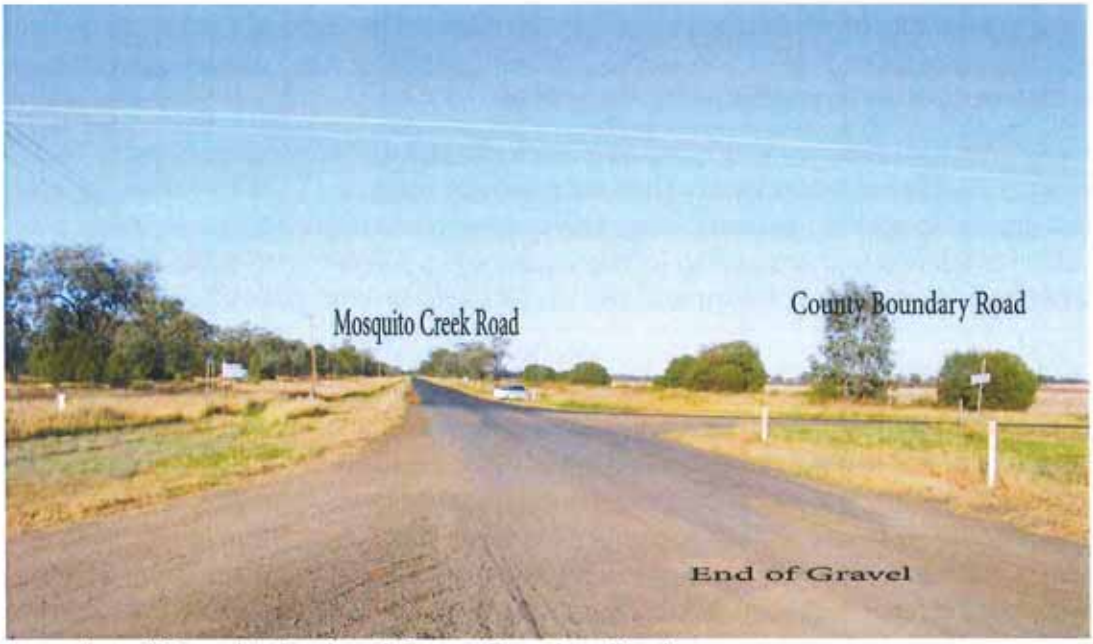


Figure 6: Intersection of Mosquito Creek and County Boundary Roads

8. Project Evaluation

8.1 Need for the project

The black soil plains in the Moree, Narrabri and western regions do not contain hard rock deposits suitable for use in civil construction. Such material is sourced from deposits located within the New England volcanics on the western extend of the ranges where access is possible.

The local gravel materials available within the northwest NSW Plains consist of mainly clayey river based gravels or mudstone materials. These gravels have been utilised for many years but have a high maintenance cost due to their plasticity issues, high rates of wear and tear, as well as failures to carry modern loads for larger numbers and frequencies of vehicles in all weather conditions. These local gravels rarely meet current specifications for road base gravel; however they continue to be used by mainly local Council as a result of cost limitations and accessibility.

To meet current and future traffic loads on the main arterial roads in the region, authorities have increased the standard of road base gravels to a hard wearing and more stable material with considerably less fines than previous specifications. Few if any of the local gravels meet this specification without major modification. All major road construction projects and infrastructure works are therefore sourcing aggregate materials from hard rock quarries. Four quarries are available between Narrabri and Goondiwindi. Two of these quarries extract rock from the southern tip of the Mt Kaputar range and supply to the Narrabri region. Significant demand increases are occurring as a result of the influx of coal mining to this area which is utilising the available annual capacity of these two quarries which limits the ability of the quarries to supply aggregate to other projects in the Moree region.

A third quarry is located east of the town of Inglewood in Qld. The quarry is approximately 100 km east of Goondiwindi. This quarry material provides hard rock aggregate to the Goondiwindi area and is generally delivered by road trains and B-triple configurations to reduce transport costs. This quarry also provides aggregate to a large part of southern Qld.

The existing Runnymede quarry originally provided hard rock aggregate to the Moree and Warialda region. It now supplies hard rock aggregate to the Gwydir, Moree Plains, Goondiwindi, Balonne, Walgett and Brewarrina Shires. Demand from projects within these regions is exceeding production limits. Many of the project that require hard rock materials now appear to be working on a schedule based on production availability at Runnymede Quarry and the rate and cost of despatching this material from the quarry. Many of these projects are therefore restricted in construction rates which generally cause a higher cost base to maintain the equipment on the construction site. Other regional quarries available such as the Inglewood quarry and quarries in the Toowoomba region can supply hard rock

materials at a greater rate of production. However, as indicated production from these quarries is also in demand and therefore the cost of obtaining the material from these more distant quarries is exacerbated from both haulage cost and competition for the product.

Other suitable sites for hard rock quarrying have been identified in the region. None of these facilities operate on a permanent basis at present. They are generally restricted to short periods of operation to provide raw gravels to specific projects. Any new quarry would require adequate reserves of suitable rock as well as extraction and processing infrastructure and a suitable road network for the transport and delivery of extracted material. A Greenfield site would likely be both difficult and expensive to establish.

Demand for hard rock aggregate is increasing as a result of capital works programs requiring a better aggregate material than the material that is available locally on the black soil plains. The aggregate available at Runnymede is considered to easily meet the specifications for the aggregate demanded and therefore pressure is being placed on the Proponent to produce more aggregate. The proposed increase in aggregate production would mainly be utilised for major road projects funded by State and Federal Governments on the Newell and other regional highways to carry farm commodities to ports and rail heads. Future projects that may require local hard rock would include the inland rail network and mining projects in the region.

The current annual limit of 120,220 tonnes is insufficient for regional demand and therefore an increase in annual capacity is necessary.

8.2 Alternatives considered

Hard rock deposits suitable for use in concrete manufacture and road and rail construction are restricted to the rocky hills and do not extend onto the plains area. The basalt material extends to the east from the edge of the plains associated with the Gwydir and adjoining valleys. Other potential deposits of basalt are likely to be found in the adjoining Bullala National Park, properties south and east of Runnymede and similar geological regions on the eastern edge of the black soil plains extending to the south into Mt. Kaputar.

No other large hard rock quarries are currently approved under Council consents or have obtained an environment protection licence to quarry more than 30,000 tonne per year in the immediate region between Mt. Kaputar and the northern end of western most outcrops. Some smaller quarries have been developed for local gravel materials by Council for local road developments.

Alternative quarry sites would need to be capable of providing a total annual output of up to 300,000 tonne per year. This could be achieved through the use of multiple quarry sites or development of a Greenfield site. Similar issues would occur in relation to potential environmental impacts and infrastructure dependencies if a new site were to be developed.

The proponent could purchase a new site to develop a quarry with an extraction limit of 300,000 tonne per year. This would involve the surrender of the value of infrastructure on the current site and redevelopment of this infrastructure on a new site. An alternative site to achieve this is available in the Terry Hie Hie region. This site is relatively isolated and therefore would require development of an estimate 75 km of access road to a standard that would be capable of accommodating the daily truck movements in addition to local traffic. The cost of road works would be considered as prohibitive to the development as it would need to be funded in part by the applicant. The site is located in the fringes of Gwydir and Moree Plains Shire. The issues of developing this area to be suitable for road train traffic would be considerable and costs would be prohibitive in relation for potential infrastructure development through Council funding and construction arrangements.

Development of other quarry sites is possible through the purchase of other land as the areas similar to Runnymede farm are not heavily populated due to the low potential for agricultural yields. As a result of this limited production, the available road infrastructure servicing these areas is also limited. The impost of a major industrial site within such an area would incur the same issues that have been dealt with over the past 18-years of operation and road development associated with the current Runnymede site.

The redevelopment of a new site or upgrade of other existing quarries to a production level similar to the existing Runnymede operation, would incur an additional capital cost in the order of $6 million to $10 million for purchase and establishment of new crushing and screening equipment. This cost could potentially be halved if machinery from Runnymede was transferred to the new site and Runnymede was closed down. The total cost of a Greenfield site or upgrade of an alternate site would need to include appropriate contributions to Council infrastructure. Due to the requirements for heavy vehicles associated with the quarry, local road upgrades would need to be of a standard suitable for road trains. Such works would involve a road redevelopment cost of $100,000 per km or more in addition to replacement or upgrade of local bridge structures and stream crossings. The potential cost of developing a new site would be in the order of $8 to $12 million. This cost would need to be applied to the cost of gravel material hauled from the site. Allowing for an average of 225,000 tonne per annum over a 5-year return period (life of the machinery), this would add between $7.11 and $10.66 per tonne of gravel. Gravel from the existing site is valued at between $16 and $22 per tonne. The development of a new site could therefore add an additional 50 percent to the onsite cost of the material prior to transport costs. In relation to development of a major road project, the gravel component cost is estimated to be one third to one half of the total project cost. The resulting development cost would therefore incur additional infrastructure cost burden in the order of 25 to 50 percent of the current project value. With limited budgets available for major road reconstruction, the resulting impact would involve a 25 to 50 percent reduction in the length of road replacement each year.

If this proposal does not proceed then production would be limited to present levels. Suitable material will have to be imported into the region to make up the shortfall between local production and increasing demand. This material would need to be hauled from alternative sources and therefore greater distances. Transport costs would increase and therefore with limited budgets for public infrastructure such as the region's major highways, the length of roads to be reconstructed each year would reduce. The reduction in the replacement program would result in an increase in general short-term maintenance costs.

8.3 Development to be carried out at Runnymede

8.4 On-site

The development consent requested is to increase the annual production limit from 120,220 tonnes to 300,000 tonnes per annum. The increase in production would be undertaken using the same equipment that operates on the site at present. At present, the capacity of the equipment on the site is under-utilised.

It should be noted that a separate application has been lodged with the Gwydir Shire for their consideration to increase hours of operation from the 7 am to 5.30 pm Monday to Friday, to the hours presented in the above table 1. The proposed operating hours would extend up to 12-hours per day for equipment within the quarry pit.

Truck access to haul from the quarry would be slightly extended during Monday to Friday; however the application adds additional time for operations outside of Monday to Friday. The intention of the proposal is to replace smaller trucks that carry a maximum of 30 tonne per load with road trains that are capable of carrying up to 50-tonne of gravel per load. The proponent has a base in the Moree Plains Shire where road train use has been part of normal operations for an extended number of years. These road train configurations would be utilised as part of daily operations from the quarry in replace of single trailers. The transport efficiency gains would be in the order of 30 to 50 percent per load.

A normal equipment replacement program is to be undertaken as the existing equipment wears out. Equipment such as front-end loaders and crushers are upgraded on a regular basis to more modern and efficient machinery. The proponent has already replaced older primary and secondary crushing equipment with high volume and more technically reliable equipment to reduce breakdown times.

No construction work is required to alter the operating hours at the quarry. Some management changes would be required in order to operate the site. This would include staffing levels in order to operate the site at a higher level of daily production. On occasions, stockpile levels would increase when a build-up of product is required for specific projects. This would be a short-term onsite planning issue.

The Proponent has developed an Environmental Management Plan (EMP) in line with current best practise operations for any industrial type facility. The EMP presents an outline of the requirements to operate the site and monitor the operations in order to determine whether the operations meet the Proponent's environmental responsibilities. These responsibilities include a shutdown proposal if emissions from the site exceed the state criteria for mainly dust or noise emissions. Other management operations such as management of water resources on the property will also increase in significance for management as without water, the operation may need to cease until conditions change in order to manage dust emissions from the operation. Dust management practises include road watering and dust suppression within the secondary crushing and sieving plant.

8.5 Off-site

The proposal for upgrading of the haul road between the quarry and the closest bitumen road in the Moree Plains Shire has been agreed to with the Gwydir Shire Council under the existing approvals. These existing approvals are presented in appendix 5. The Deed of Agreement prepared as part of the original approval process forms part of the current operating conditions. All matters in relation to this deed are considered as "up-to-date" between the Proponent and Council.

Clause 11 of the Deed of Agreement allows for variations to the original Deed. This is being undertaken at present in response to an agreement to clearly identify one haul road between the quarry and Moree Plains Shire that is to be upgraded and road train use is to be permitted on this road.

The detail of the recent proposal has not been verified by both parties in relation to timing due to the need to schedule operations between the two parties for delivery of materials and construction of the road train haul route.

Once the haul route is completed, offsite works would be limited to maintenance of this main haul road.

No other offsite works would be required as the quarried material is generally hauled directly to construction sites where the materials are used.

9. Rehabilitation of the site

Johnstone Concrete and Quarries is committed to an integrated approach to rehabilitation of all the areas currently disturbed and planned to be disturbed within the project site.

9.1 Land Tenure and Zoning

The land comprises Lots 52 and 53 in Deposited Plan 751093 and is freehold land owned by the proponent.

Gwydir Council continue to operate under three Local Environmental Plans as a result of the amalgamation of the three local Councils. The Warialda region operates under the Yallaroi Local Environmental Plan 1991. Within this plan, Runnymede is located in an area zoned as 1(a) (General Rural).

9.2 Rehabilitation and Final Land Use Objectives

Site rehabilitation requirements are covered in current development consents and as the overall footprint of the quarry would not change there is no requirement to amend the proposed rehabilitation. The proposed rehabilitation works include:

- To produce a stable final landform able to support the continued use of the land for grazing;
- To provide a number of water storages to support the use of the land for grazing;
- To minimise the environmental impact of all site earthworks associated with rehabilitation works;
- To optimise the use of available overburden and topsoil as a substrate for revegetation; and
- To revegetate the disturbed ground of the quarry operation with native vegetation species
- To achieve a stable and functional drainage system at the site that does not generate sediment levels that are considered above natural levels

9.3 Potential Contamination

Prior to rehabilitation commencing, a preliminary site investigation would be undertaken to determine whether any areas are contaminated. The investigation would be undertaken in accordance with State Environmental Planning Policy No.55 – Remediation of Land. Any areas of contamination would be remediated if the investigation indicates such is required. This investigation would determine whether rehabilitation could proceed or whether remediation should be occur prior to rehabilitation works commencing.

9.4 Description of Final Landform

The final landform would be free draining with a gently sloping floor to the west. Drainage would be designed to utilise existing sediment dams which would remain in place.

The existing extraction faces would be retained and a four-strand rural fence erected along the top of the faces to exclude cattle. Stockpiled topsoil and overburden would be spread on the pit floor and the stockpile area, fertilised and vegetated with pasture grasses.

9.5 Final land use

Once the pasture is established, the area would be used to graze cattle and horses.

9.6 Rehabilitation Method

As the pit floor would continue to be used for stockpiling raw material and coarse crushing operations, rehabilitation would not commence until quarrying ceases. Rehabilitation would be completed within 12 months of closure, subject to final management decisions.

Following closure all stockpiles would be removed. Machinery would then be dismantled and removed from the site. Following the contamination assessment the land would be remediated if contamination was found. If no contamination was present, stockpiled overburden would be spread and shaped to provide the required landscape. This would be followed by topsoiling, fertiliser and sowing of annuals and pasture seed.

After the pasture was fully established the regenerated areas would be returned to grazing.

10. Likely staging of the project

The quarry is already operating and staging is not proposed. The quarry operates in response to demand and the machinery presently in use is capable of accommodating the additional output.

The use of road trains to haul gravel product to and from the site would be restricted until Gwydir Council provides the approval for the access roads through their Shire. This approval for road use would result in some staging of the development.

11. Existing Environment

11.1 Regional setting

Runnymede quarry is located in the Northern Basalts subregion of the Brigalow Belt South region in northern New South Wales mid-way between the towns of Moree and Warialda. The quarry is located on the western edge of a basalt ridge that runs approximately east-west in direction. The quarry operation has entered the ridge from the western end and is extracting materials toward the east with some minor extension of the quarry face on the northern edge.

The quarry is located on the eastern edge of the Milguy area which is an elevated part of the Gwydir River catchment. The village of Milguy is limited to one house and a grain receival facility. The closest town is Pallamallawa, some 16 km to the southwest.

The quarry is located within an extensive area of woodland which includes both privately owned and publicly owned land. The publicly owned land is the Bullala National Park which was created from the Bullala Forest. The forest was logged for mostly cypress pine and some hard wood species. The surrounding private land is similar in topography to Runnymede as it includes extensive areas of rock outcrops and woodland. The majority of this adjoining land is utilised for opportunity grazing of mainly cattle.

Bullala creek is located to the west of the quarry. The catchment of this creek is located in the basalt slopes and a minor part of the undulating landscape to the west. The creek drains into Mosquito creek. To the west of Bullala creek, the landform changes to rich basalt derived soils which has been cleared extensively and utilised for cereal crop production. Most of the residences associated with the farming properties to the west are accessed from the bitumen sealed county boundary road which separates Moree Plains and Gwydir Shires. The boundary of the Shire is approximately 8.6 kms due west of the western boundary of Runnymede.

The site has been the subject of a number of inspections to gain data related to resource proving, topographic survey, noise monitoring, dust monitoring, meteorological data monitoring, Aboriginal cultural heritage and flora and fauna surveys. Following desktop studies which included interrogation of DEWHA, DECCW and CMA databases and the taxons list of *Flora of Bullala National Park* (Dr John T Hunter) kindly provided by National Parks and Wildlife Service, flora and fauna surveys conducted on the 4th of June 2009, 25th of October 2010 and the 2nd of August 2011.

The surveys revealed that the area on which the basalt resource is located is on the top of a ridge and has in the past been cleared and farmed by a previous owner. The extraction area is now grassed and used for grazing. There is some scattered timber regrowth. The remainder of the property was previously logged for Cypress timber for the building industry and natural regrowth is occurring. Native vegetation on the property has been highly disturbed since the early 80's. Remnant areas of native vegetation have remained relatively undisturbed since the 1995 development of the quarry. The cleared open areas previously farmed have been utilised by the quarry operation for development, grazing as a secondary opportunity on the property and as part of the residence. The quarry area remains relatively surrounded by native vegetation which has formed a natural buffer to contain some impacts of the quarry such as the visual impact. Many areas of native vegetation regrowth exhibiting trees that are less than 10-years old are forming as a result of the quarry operation not utilising all land that had been previously cleared for agriculture.

11.2 Landform

The landform comprises undulating low stony hills with sandy wash and a mixture of sandy loams and heavy clays deposited on the valley floors.

The area to be quarried consists of a ridge line approximately 300m in width with moderate to steep natural slopes on either side. Rocky outcrops are present across the site. The ridge rises to the east.

The surrounding gullies are steep and contain only small ephemeral water holes that fill after rain. Dams have been constructed in these gullies to provide stock water. The dams now double as a source of water for the quarry. Dam capacity has been limited to levels permissible under the Harvestable Rights policy for NSW.

11.3 Geology

The geology of the quarry site comprises Tertiary basalts over Jurassic quartz and alluvial sediments derived from these. The Jurassic sandstones form an intake bed for the Great Artesian Basin. Local intake beds are blocked by the tertiary basalt outcrops similar to the formation found at Runnymede.

The basalt quality and extent have been confirmed by exploratory drilling and laboratory testing which has confirmed that the material satisfied NSW RMS requirements for construction aggregate and complies with *AS 2758.1 Aggregates and rock for engineering purposes – Concrete Aggregates.*

On the lower slopes and in the valleys, the landscape consists of Jurassic sandstone outcrops overlain by sandy soils with areas of exposed sandstone in the creek beds and banks.

Heavy clay soils predominate in the plains to the west and on the alluvial flats associated with the Gwydir River floodplain.

11.4 Soils

Surface soils on the site of the quarry consist of shallow black loams with extensive rock content. The soils on the slopes consist of similar soil; however they have been naturally affected by erosion and the extent of exposed rock increases with slope.

Soils on the lower flatter areas on the western part of Runnymede consist of sands and sandy loams to a depth of 2 m or more. (Refer figure 12) These sands appear to exist as a result of erosion of the sandstone material available in the surrounding gullies.

Clay content of the surface soils increases to the west. On the western side of Bullala creek, only few areas of sand are present. The majority of the surface soils to the west consist of grey black and brown clays.

11.5 Hydrology

11.5.1 Surface water

The Warialda area receives an average rainfall of 688.3mm per year (BOM statistics). Surface water from Runnymede that is not captured in internal catch dams or infiltrates into the sandy soils will flow into Bullala Creek. Bullala Creek is an intermittent watercourse that traverses the northern and western edge of Runnymede. Bullala Creek flows in a south-westerly direction to join with Mosquito Creek which flows eventually to the Gwydir River.

11.5.2 Groundwater

Information from the NSW Office of Water indicates that groundwater suitable for stock and domestic use is available from the Jurassic sandstone beds. This water is located in the artesian intake beds.

Bore logs indicate that the artesian aquifer in the Runnymede area is approximately RL 279 m (AHD) as identified in Bore GW 900555. At the property "Eastlands" the aquifer was located at RL 246 m (AHD) in bore GW032676.

The quarry floor at Runnymede is at RL 346 m (AHD) or approximately 67 metres above the artesian aquifer. No groundwater has been encountered during the quarrying process to date.

Some isolated fractured rock aquifers may be present as a result of some fracturing of the basalt materials where sandstone layers are present in the surface. The general nature of the basalt layers would limit the potential capacity of these aquifers. At present, they do not form any part of the local water supply options.

A sub-artesian bore was drilled on the site to provide domestic water for the residence and workshop. This bore provides a supply of approximately 2-3 litres per second. The aquifer utilised is above the artesian aquifer identified in surrounding bores. This shallow aquifer is considered to be in fractured rock associated with sandstone material.

11.5.3 Water quality

Surface water in the natural streams surrounding Runnymede has been observed to have relatively high sediment levels as a result of surface erosion from farms and within the gully beds. The general catchment of the creek and gully system include only limited development for grazing purposes and therefore the general quality of the streams is considered to be relatively pristine other than the silt load.

The Runnymede quarry area includes a series of catch dams that act as sedimentation dams. The dams have been built in accordance with existing approvals to form part of the erosion protection works. The EPL requires testing of water discharges from the sediment ponds after significant rainfall. Appendix 6 presents a copy of results obtained after a single event storm caused an overflow from the sediment system. The overflow is a rare occurrence in the past 10-years due to numerous years of dry extremes which enabled the pond to be almost drained. The results indicate a low sediment concentration of 14 mg/L. The EPL limit is 50 mg/L. The level of oil and grease in the sample is <10 mg/L. This is considered as acceptable. No limit is set under the EPL for oil and grease; however the sample did not show any visible signs of pollution from the quarry operation.

Groundwater in the region consists of mainly artesian water. This water is located in the intake beds of the upper folds connected to the western deeper aquifers of the artesian aquifer. Water quality for this artesian water has a total salinity in the order of 0.35 mS/m and SAR of less than 2. This suggests that the artesian water is relatively young and fresh from the intake beds. The quarry does not intercept the local aquifer or intake bed area and therefore would not disturb the artesian aquifer. The aquifer is presently used for stock and domestic water for the residence and site ablutions. Properties to the north

of the quarry utilise this artesian water for irrigation purposes as they are located in the northern intake belt area and have been issued with irrigation licenses for the use of this water.

12. Flora and Fauna

12.1 Fauna

The land on which the quarry is situated is used for grazing of mainly horses and a number of cattle. A small mob of grey kangaroos was observed grazing with the horses. The wallaby populations, feral pig and fox population is extensive in this area.

A search of the Atlas of NSW Wildlife for a ten square kilometre area centred on the quarry revealed that ten vulnerable species and one endangered species may be present in the above search area. A search of the Threatened Species Database for the Northern Basalts CMA Sub Region identified a further ten species as possible candidates for assessment. As a result of these searches a list of species was developed to allow targeted surveys of the site to be undertaken. A seven Part Assessment was then conducted and the results of this assessment are included in appendix 9 and Section 15 of this report. The assessment includes an extensive listing of listed threatened fauna species that may be present on the site.

The habitat area to be impacted by the extension of the quarry consists of highly disturbed ground with minimal natural refuge points available for small less mobile species. The habitat surrounding the quarry activity remains relatively undisturbed by vehicles or people during the quarrying process. This provides relatively safe undisturbed areas for native species that are present in the area. Larger species less vulnerable to predators tend to utilise the open grazing areas for browsing. Due to the lack of tree or understorey cover, more vulnerable species such as small marsupials would tend to utilise surrounding corridors such as the undisturbed parts to the east of the quarry to traverse the property.

12.2 Flora

The area approved for extraction was previously cultivated and now comprises open pasture, the adjoining slopes support a mitxture of vegetation comprising mostly White Cypress (Callitris glaucophylla), Wilga (Geijera parviflora), Ironbark (Eucalyptus creba), Budda (Eromophila mitchellii) and scrubby acacia species. Groundcover is sparse in the timbered areas due to the closed nature of the canopy which prevents sunlight reaching the ground. The existing woody vegetation is relatively young and dense which suggests that the area has been heavily logged in the past. This suggestion is further supported by the fact that the present Bullala National Park was until quite recently a State Forest. Logging extended into private land holdings to obtain mainly cypress.
A search of the Atlas of NSW Wildlife did not reveal any threatened flora within a 10 square kilometre area centred on the quarry.
Vegetation noted on the area subject to extension of the quarry is presented in Table2.

Table 2: Observed vegetation on and surrounding the development site

Vegetation	Location
Paspalum (*Paspalum dilatatum*)	On disturbed areas around sediment dams
Couch (*Cynodon dactylon*)	On batters for stabilisation
Wiry Panic (*Entolasia stricta*)	Along roadsides on red sandy soil
Pitted Bluegrass (*Bothriochloa decipiens*)	On open grazing areas
Wire Grass (*Aristida spp*)	On open grazing areas and on red sandy soil
Coolatai Grass (*Hyparrhenia hirta*)	Along roadsides and on disturbed red sandy soils under young pioneer Wattle
Wattle (*Acacia leiocalyx*)	Pioneer species on disturbed areas, also invading open grazing areas
Wattle (*Acacia deanei*)	As above
White Cypress (*Callitris glaucophylla*)	Dominant regrowth on logged areas

Vegetation	Location
Ironbark (*Eucalyptus creba*)	Young trees interspersed throughout the White Cypress regrowth
Wilga (*Geijera parviflora*)	Occasional regrowth on the edge of disturbed areas and grazing areas
Budda (*Eromophila mitchellii*)	As above

Several weed species are present in disturbed areas but other than Coolatai Grass, are not reported here as result of ground disturbance and colonisation of common weed species to the region.

The remnant uncleared wooded areas on the property comprise scattered Ironbark as an upper canopy with dense Cypress forming a closed mid storey. The woodland areas that have been disturbed now include various species of grass and other ground cover. The dominant species of grass are noted in table 2.

The following photograph, Figure 7, shows Gil Gil Creek Road where it passes through the Bullala National Park north of the quarry entrance. Vegetation comprises an open upper storey of Ironbark (*Eucalyptus creba*) and a dense closed understorey of White Cypress (*Callitris glaucophylla*). The closed nature of the understorey means that little sunlight reaches the ground and there is little to no ground cover apart from occasional tufts of Wiry Panic or Coolatai Grass.

Figure 8 shows the grazing area that has been approved for the extraction of basalt. The topsoil in this location has been derived from the weathering of basalt and is relatively fertile. This soil is being progressively stockpiled and will be used in the rehabilitation of the land once mining has ceased. The photograph highlights the extent of surface rock which limits ground cover growth.

Figure 9 shows the lack of groundcover on the nutrient poor sandy soils on the slopes and valley floor. These areas have been previously disturbed by clearing in an earlier attempt to encourage grass growth. The areas have been left relatively undisturbed; however minimal ground cover has regrown.

Figure 10 shows Acacia pioneers on the edge of the extraction area and Figure 11 shows Acacia growth on disturbed areas around a sediment pond.

Figure 12 shows the shallow 'A' horizon in sandy soil which contains little organic matter, thick Callitris regrowth in the background.

Figure 7: Gil Gil Creek Road, the closed nature of the understorey precludes the formation of a grass groundcover

Figure 8: Area approved for mining which is presently used for grazing

Figure 9: Lack of groundcover on sandy soils with Acacia spp in foreground

Figure 10: Acacia pioneers on the edge of the cleared grazing area around on top of the quarry ridge with White Cypress in the background

Figure 11: Sediment pond surrounded by a variety of Acacia regrowth

Figure 12: Shallow 'A' horizon in sandy soil, dense Callitris regrowth in background at Sand Pit 1

12.3 Flora and Fauna Summary

A desktop survey of the area that would be affected by the operation of the quarry was undertaken to determine which species were likely to be encountered in the locality. This was followed by a site searches over an extended period between June 2009 and August 2011 to observe seasonal changes in flora content. The flora surveys determined that the continued operation of the quarry within its approved boundaries would not have a significant effect on threatened species, populations, ecological communities, or their habitats (Environmental Planning and Assessment Act 1979) nor would it

comprise a Controlled Action (Environment Protection and Biodiversity Conservation Act 1999 (C 'wealth)).

13. Climate

13.1 Meteorological data sources

Long term meteorological data has been obtained from records from the Warialda Post Office and the Moree Meteorological Station.

13.2 Temperature and humidity

Temperature and humidity levels in the region are quite mild with the annual average temperatures ranging between 8.3 to 26.2 degrees Celsius although temperature extremes of -9.2 and +43.1 have been recorded.

Mean Daily Temperature (^{0}C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	33.5	32.6	30.6	26.5	22.0	18.2	17.6	19.4	23.2	26.9	30.2	32.6
Min	16.3	16.0	13.2	7.9	3.6	1.4	0.0	1.3	4.2	8.8	12.2	15.1

Mean Daily Humidity (%)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9am	60	62	63	66	70	73	71	67	62	59	58	57
3pm	49	42	35	36	42	44	38	42	38	38	35	45

Average humidity tends to be high in the morning period and decreases through the afternoon.

13.3 Rainfall and evaporation

Average annual rainfall is 688.3mm per year in the Milguy region. Rainfall intensity is generally summer dominant as a result of tropical type storm events. Extensive winter rainfall does occur on occasions. Evaporation figures are only available from the Moree Bureau of Meteorology station. The evaporation rate is predicted to be slightly less at Runnymede as a result of lower night time temperatures.

Statistic Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
10% rainfall (mm)	24.6	15.3	5.8	1.3	3.7	8.1	6.6	5.1	5.0	19.2	13.7	20.9	129.3
50% rainfall (mm)	71.8	62.7	48.3	30.3	33.4	37.1	40.6	35.0	36.0	51.0	56.6	58.4	561.2
90% rainfall (mm)	179.3	158.7	142.6	91.3	103.6	91.8	84.0	81.2	93.4	117.7	142.2	137.8	1423.6
Mean evaporation (mm) Moree	289.9	232.8	220.4	147.4	97.1	68.3	72.6	98.1	142.9	209.6	257.1	300.1	2136.3

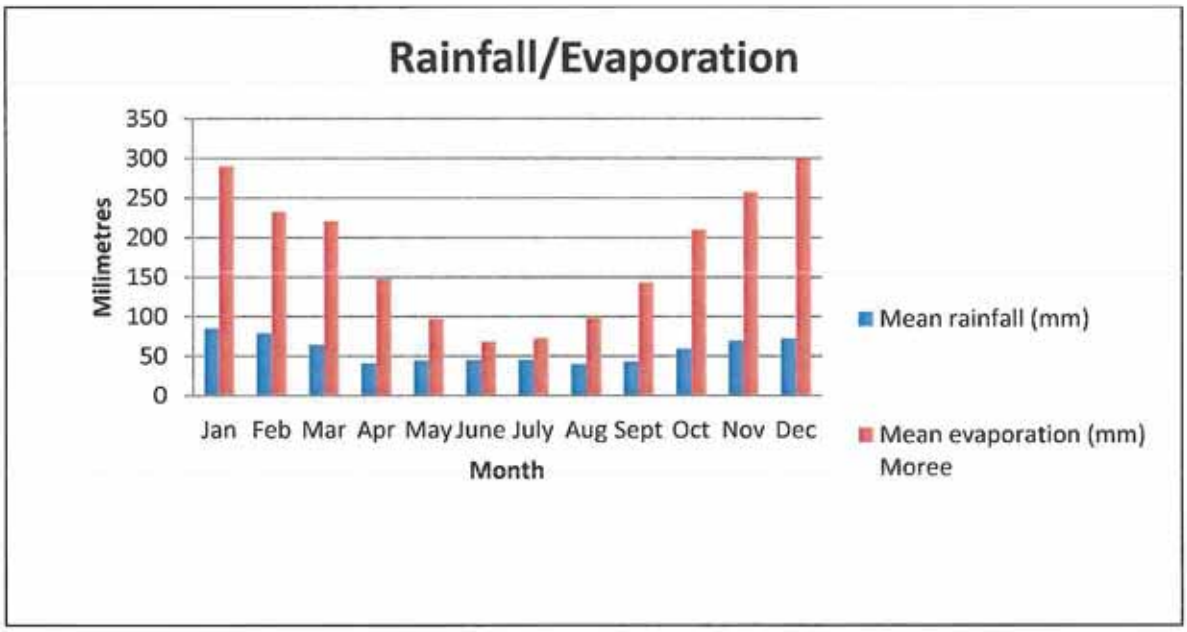


Figure 13 Warialda area rainfall and Moree evaporation (BOM)

An assessment of rainfall and evaporation rate indicates a substantial evaporation deficit. This would affect operations at the quarry in relation to potential issues of dust generation as the quarried material and roads remain in a relatively dry state for extended periods.

13.4 Wind

Winds in the region are moderate with katabatic based north easterlies predominating in the morning and south westerlies in the afternoon. The morning winds are on occasion generated from cooler air on the higher slopes to the east. The following table presents general wind speeds based on records from BOM at Moree which maintains an extensive data base for the region.

Mean Wind Speed (km/h)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9am	8.0	8.1	8.0	5.9	5.5	4.1	4.3	5.2	8.4	8.9	7.9	7.8
3pm	12.8	11.1	15.5	13.3	12.0	8.8	9.9	10.5	10.6	12.3	8.9	11.0

Wind frequency analysis data from the Moree Bureau of Meteorology suggests that the majority of winds are less than 20 kilometres per hour as shown on the vector diagrams presented in figure 14.

The BOM analysis of wind direction indicates that NE wind is dominant in the morning and then tends to the southwest and west of an afternoon. Summer rain is generally preceeded by northeasterly winds and then delivered through a southwesterly to northwesterly wind pattern.

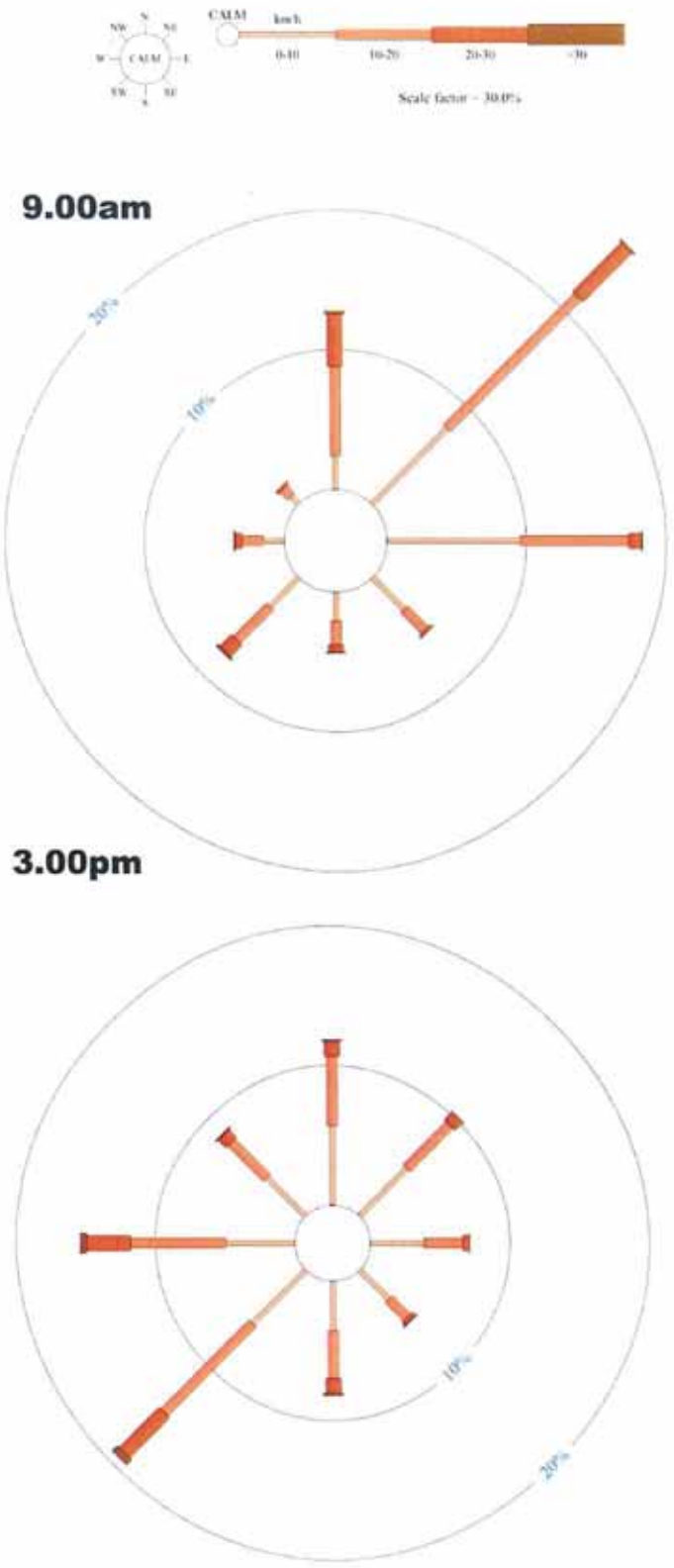


Figure 14: Annual wind roses for the Moree region

14. Environmental Risk Analysis

Risk is the chance of something happening that would have an impact on the environment or operation of the project and is measured in terms of consequence and likelihood. Qualitative consequence and likelihood ratings developed for this project are set out in the following tables.

Table 3: Qualitative Consequence Rating

Qualitative Consequence Rating		
Level	**Descriptor**	**Description**
1	Insignificant	• Negligible and temporary detrimental impact on the environment • Affects an isolated area • No remediation costs • Reportable to internal management only • No operational constraints posed • No injuries or health impacts
2	Minor	• Minor detrimental impact on the environment • Affects a small area • Minimal remediation costs • Reportable to internal management only • No operational constraints posed • Minor injuries which would require basic first aid treatment
3	Moderate	• Substantial temporary or minor long-term detrimental impact on the environment • Moderately large area of impact • Moderate remediation cost • Reportable to government agencies • Further action may be requested by government agency • Injuries requiring medical treatment
4	Major	• Extensive and/or permanent detrimental impacts on the environment • Large area of impact • Very large remediation costs • Reportable to government agencies • Possible prosecution and fine • Serious injuries requiring medical treatment
5	Catastrophic	• Massive and permanent detrimental impacts on the environment • Very large area of impact • Massive remediation costs • Reportable to government agencies • Large fines and prosecution resulting in potential closure of operation • Severe injuries or death

Table 4: Qualitative Likelihood Rating

Qualitative Likelihood Rating		
Level	**Descriptor**	**Description**
A	Almost certain	Is expected to occur in most circumstances
B	Likely	Would probably occur in most circumstances
C	Possible	Could occur
D	Unlikely	Could occur but not expected
E	Rare	Occurs only in exceptional circumstances

The risk associated with each environmental impact was assessed without the inclusion of any operational controls or safeguards based on the qualitative assessment of consequence and likelihood and a risk ranking in order of low (L), medium (M), high (H) or extreme (E) was assigned to each potential impact based on the matrix below.

Likelihood	Consequences of Unmitigated Risk				
	1 (Insignificant)	2 (Minor)	3 (Moderate)	4 (Major)	5 (Catastrophic)
A (Almost certain)	H	H	E	E	E
B (Likely)	M	H	H	E	E
C (Possible)	L	M	H	E	E
D (Unlikely)	L	L	M	H	E
E (Rare)	L	L	M	H	H

Figure 15: Unmitigated Risk Matrix

The four risk rankings are defined as follows:

- **Low (L)** – requiring a basic assessment of proposed controls and residual impacts. Any residual impacts are unlikely to have any major impact on the local environment or stakeholders.
- **Moderate (M)** – requiring a medium level of assessment of proposed controls and residual impacts. It is unlikely to preclude the development of the project but may result in impacts deemed unacceptable to some local or government stakeholders.
- **High (H)** – requiring in-depth assessment and high level documentation of the proposed controls and mitigation measures. This level of risk could preclude the development if effective control and mitigation measures are unavailable.
- **Extreme (E)** – requiring in-depth assessment and high level documentation of the proposed controls and mitigation measures and possible preparation of specialised management plan. This level of risk may preclude the development if not considered to be adequately managed by the controls and/or management plan.

For each environmental risk identified in the following table the potential environmental impacts have been allocated a rating based on the potential consequences and likelihood of occurrence to produce an analysis of the unmitigated risk.

Figure 16 Analysis of Unmitigated Risk

Analysis of Unmitigated Risk			
Potential Impact	**Consequence**	**Likelihood**	**Risk Rating**
Transport/traffic			
Increased traffic on roads	1	A	M
Increased wear on road pavement	1	A	M
Increased risk of accident – major accident	5	E	H
Increased risk of accident – serious accident	4	E	H
Increased risk of accident – minor accident	3	E	M
Noise			
Increased noise impact at sensitive receptors	2	E	L
Increased traffic noise	2	A	H
Air quality			
Deposited dust impact on off-site vegetation	1	E	L
Deposited dust impact on residences	3	C	H
TSP – nuisance to residences	1	E	L
PM10 – health impact at residences	1	E	L
Significant emissions of GHG	2	D	L
Visual amenity			
View from public place	1	E	L
Surface water			
Reduced water quality in Bullala Creek	1	E	L
Reduced flow in Bullala Creek	1	E	L
Groundwater			
Reduced water quality of groundwater	1	E	L

Analysis of Unmitigated Risk			
Potential Impact	**Consequence**	**Likelihood**	**Risk Rating**
Impacted level of groundwater table	1	E	L
Soils and land capability			
Loss of soil by erosion	2	D	L
Sedimentation	2	D	L
Reduction in land capability	2	C	M
Flora and fauna			
Significant impact on threatened species	2	D	L
Heritage			
Aboriginal	2	E	L
European	1	E	L
Technological hazard			
Hydrocarbon spill	3	C	H
Explosive accident	4	E	H
Machinery accident	3	C	H
Natural hazard			
Bushfire	2	C	M
Waste			
Litter and waste contamination	1	D	L
Socio-economic impacts			
Increased employment	2	A	H
Increased economic activity	3	B	H
Loss of value on adjoining properties	1	E	L

The following issues have been identified for further assessment:

- Relevant Key Issues identified in the Director General's requirements;
- The issues identified in the Environmental Risk Assessment as having a high or extreme risk rating.

15. Environmental Assessment

15.1 Traffic and Transport

The Director General required a detailed assessment of the potential impacts of project-related traffic on the safety and efficiency of road networks. The following sections present an assessment of road and traffic issues.

15.1.1 Existing road network

The application to increase production at Runnymede quarry will result in changes to the current transport routes used by trucks generated by the quarry. The major local route will consist of Gil Gil Creek and Mosquito Creek roads in the Gwydir Shire. Once in the Moree Plains Shire, several routes are available and selection of the route will depend on the final destination of the product. For destinations to the west of the Newell Highway and south of Moree, trucks will generally utilise the Gwydir Highway through to Moree. For destinations north of Moree on the Newell highway, trucks may utilise various local roads within the Moree Plains Shire to minimise travel distance.

The Gwydir Highway is the main route between Moree and Pallamallawa with a secondary bitumen sealed route being via the Newell Highway and the Camurra-Warialda Road (River road) to Pallamallawa. From Pallamallawa the agreed route is along Mosquito Creek Road and Gil Gil Creek Road leading directly to the quarry.

An assessment of heavy vehicle routes from the quarry to the Newell Highway has revealed that the majority of the routes are NSW RMS approved for road trains in Moree Plains Shire and limited to B-

doubles in the Gwydir Shire. The Gwydir Shire is presently undertaking an agreed proposal to allow the use of road trains along the main haul route as indicated previously.

15.1.2 Traffic Generation

Presently, the quarry operates five days per week, Monday to Friday inclusive between 7.00 am and 5.30 pm. Present approved quarry output is 120,220 tonnes per year and weighbridge records for the year September 1, 2010 to August 31, 2011 show that there were 5,056 deliveries for that period from the quarry. Each delivery involved a two way trip from the quarry. Allowing for approximately 2-weeks of wet weather where no despatches occur, calculations for traffic generation over a 12-month period for 5-day per week operations, indicates there were an average of 20-truck trips per day to the quarry. Haulage trucks comprised a mixture of body trucks, truck and dog, semi-trailer and B-doubles. The following table 3 presents a summary of existing and proposed trips to the quarry based on production of maximum annual amounts and an estimated long term average of the proposed annual production. The table is based on approximate proportions of trucks and vehicles recorded for site operations.

Table 5: Estimated Annual Truck and Light Commercial trips for existing and proposed production levels at Runnymede Quarry

Vehicle Purpose	Type of Vehicle	Existing Traffic (120,220 tonne)	225,000 tonne production (80%)	300,000 tonne production
Despatch	25 tonne semi-trailer	3,606	1600	1800
Despatch	B-Double	500	135	405
Despatch	Rigid truck and dog	385	0	0
Despatch	Road train	0	3600	4800
Maintenance	Light commercial	520	624	624
Staff	Light commercial	2600	3120	3640
Total Truck trips		4491	5335	7005
Light Commercial trips		3120	3744	4264

(Assumptions: 25 t/semi-trailer, 37 t/B-double, 30 t/truck & dog)

The existing operation is based over a 5-day week with no hauling on public holidays. On this basis, there would be approximately 250-days per year for haulage of gravel from the site. The average daily traffic generated from production of the current 120,220 tonne is therefore in the order of 18 trucks and 12 light commercials per day based on production over 250-days.

Under this proposal and pending approvals for the quarry, haulage operations may occur of Saturdays but no normal operations would occur on public holidays. This allows a total of 302 days per year for haulage operations.

At 80% of the expanded annual production (which is considered to be the long term production average), site operations would generate approximately 17 trucks per day and 12 light commercials per day over a 6-day week.

In a year of maximum production (300,000 tonne), an additional 1670 haulage trucks would be required when compared to 80 % production. To limit the number of trucks generated on a daily basis, the proposal involves haulage operations to occur on part of Sunday to partially offset daily truck movements. The potential loading and despatch rate needs to be considered in accordance with the proposed hours of operation. The current loading and weighbridge operation is capable of loading a maximum of 31-trucks per 10.5 hour working day (Monday to Friday). An additional 22 trucks could be loaded on Saturday and 18 trucks on Sunday. In total, site operations could load and despatch up to 195

trucks per week. This could results in haulage of up to 6,500 tonne in one week under circumstances where a large contract is to be filled in a short period. Under the predicted average conditions, only 102 haulage trucks trips per week would be generated using the distribution of trucks as presented in the above table 5. Truck number generated from the site would be variable as a result of contractual requirements. Normal operating periods would be on occasion increased up to a maximum of 31 truck trips per day.

Based on normal, an extension of operating hours from 5 to 6 and potentially 7 days per week in combination with the replacement of single trailers to road trains would result in potentially one less truck per day at 80% production (long term average) and 1 more truck per day at maximum production when compared to operations over a 5-day week. Weather and production rates may alter the daily traffic numbers on occasions due to work stopping in wet weather and more intense work in dry weather to catch up.

All roads making up the haul routes are also used by heavy farm traffic including harvest trucks, livestock transport vehicles, oversize machinery, and in Moree Plains Shire road trains are also approved. Roads in the Pallamallawa area also carry considerable heavy traffic generated by the Milguy and Crooble grain silos, despatches from on-farm grain storage, livestock production in addition to other crops such as cotton. Agricultural production results in traffic peaks during harvest and planting times which generate peaks over short periods including November/December for cereal harvest and March/April for cotton harvest.
This following section of the report analyses the road network condition and present traffic volumes.

15.1.3 Road Hierarchy

All roads to be used by traffic generated from the quarry consist of undivided two-lane roads. Table 6 provides detail of current road classifications and current heavy vehicle restrictions for the truck transport routes used between Moree and the quarry along the shortest route.

Table 6: Heavy vehicle transport route road classifications - Existing

Road	Road Standard	Section	Classification	NSW RMS approved route for:
Gwydir Highway	Bitumen sealed	Newell Highway to Grattai Road	State Highway	B-doubles and Road Trains
Grattai Road	Bitumen sealed	Gwydir Highway to River Street	Local Road	B-doubles and Road Trains
River Street	Bitumen sealed	Grattai Road to Paramellowa Street	Local Road	B-doubles and Road Trains
Paramellowa Street	Bitumen sealed	Camurra-Warialda Road to Centre Street	Local Road	B-doubles and Road Trains
Centre Street	Bitumen sealed	Paramellowa Street to Mosquito Creek Road	Local Road	B-doubles and Road Trains
Mosquito Creek Road	Bitumen sealed	Centre Street to County Boundary Road	Local Road	B-doubles and Road trains
Mosquito Creek Road	Gravel	County Boundary Road to Gil Gil Creek Road	Local Road	B-doubles
Gil Gil Creek Road	Gravel	Mosquito Creek Road to quarry entrance	Local Road	B-doubles

It should be noted that the proposed development is to involve an upgrade of Mosquito creek and Gil Gil Creek roads to allow approval for road train use. This would remain as a local road and the approval would be issued by local Council. Advice has been issued to Council from NSW RMS to enable this classification to be altered. Work has commenced on the upgrade project.

15.1.4 Traffic and Road Network

The main features of the existing traffic controls on the transport routes are:

- Gil Gil Creek Road has a speed limit of 100 km/h;

- Mosquito Creek Road has a speed limit of 100 km/h;
- Grattai Road has a speed limit of 100 km/h
- All roads within Pallamallawa have a speed limit of 50 km/h;
- Part of Centre Street and Paramellowa Street have a 40 km/h speed limit during school hours although the route does not pass the school;
- There are no weight restrictions on any of the roads;
- There are no parking restrictions on the quarry site.

The results of the assessment of the transport routes used by the existing quarry operation have revealed that there are 13.4 kilometres of gravel road between the quarry and the shire boundary between Gwydir and Moree Plains shires. These roads are two lanes with a minimum lane width of three metres. Geometry of intersections and bends accommodates the swept path of articulated vehicles and sight distances are generally satisfactory. (>150m)

The one exception is the causeway on Gil Gil Creek Road where it crosses Mosquito Creek which, although it has a width of six metres, is effectively single lane due to approaches to the causeway. This causeway is currently being redesigned and upgraded to a standard suitable for road trains. For existing conditions, it is recommended that a 'Give Way' sign be erected on the southern approach to this causeway to require empty vehicles to give way to loaded vehicles. Gwydir Shire Council is presently undertaking the upgrade of this causeway.

The present development is required to contribute to the upkeep of these gravel roads by providing an agreed one percent of the quarry output to Gwydir Shire Council under a Deed of Agreement. At present the amount of road-building materials contributed to Council totals approximately 1.88 percent of quarry output since extraction began. This agreement is currently under review by both parties. The review involves a change of direction for the contributions. The proposal involves the contributions to provide road base gravel, pre-coated bitumen and concrete that is required for construction works on the Mosquito creek road and Gil Gil creek roads.

Roads forming the haul route in Moree Plains Shire are bitumen sealed two lane roads with a minimum lane width of three metres. The roads are approved by Council for road train traffic with lengths up to approximately 36.5 m.

The town of Pallamallawa has some issues with road intersections. Intersection geometry was originally designed to accommodate single articulated vehicles up to 19 metres in length. However, Council has approved the use of road trains to haul materials through the town area as no bypass is available. Many vehicles that use these roads to service the farming community are either longer as in the case of road trains (36.5m), or wider as in the case of farm machinery than the standard 19 m long semi-trailer configuration. Subsequently, some road edge damage occurs in sharper corners as a result of road train use from farms and the quarry. Council at present maintain the road edge under a standard maintenance program. Insufficient width is available to alter the corner dimensions unless Council are to purchase some residential land. On this basis, low vehicle speed has been adopted as a standard approach to two intersections in Pallamallawa where the issue of sharp corners is encountered.

Traffic volume data has been obtained from NSW RMS published data, traffic counts for Mosquito Creek Road taken by Gwydir Shire Council and traffic counts for morning and afternoon peaks at the intersection of River and Paramellowa Streets in Pallamallawa. No specific data is available for Moree Plains Shire Council.

Annualised traffic flow on the Gwydir Highway west of Biniguy Road for 2005 is shown in Table 7.

Table 7: AADT figures for the Gwydir Highway west of Biniguy Road - Source RMS 2005 Station 91.341

Vehicle Class	AADT Eastbound	AADT Westbound	Total AADT
1. short vehicle	363	345	708

Vehicle Class	AADT Eastbound	AADT Westbound	Total AADT
2. Short vehicle towing	25	20	45
3. two axle rigid truck	18	41	59
4 .three axle rigid truck	5	6	11
5. four axle rigid truck	1	1	2
6 .three axle articulated truck	1	3	4
7. four axle articulated truck	2	2	4
8. five axle articulated truck	2	2	4
9. six axle articulated truck	17	17	34
10. B Double truck	14	17	31
11. road train	1	1	2
12. triple road train	0	0	0
Total	449	455	904

Present approved quarry production is 120,220 tonnes per annum and is carried on a mixture of rigid tippers with dog trailers, semi-trailers and road trains that are reloaded at the boundary of Gwydir Shire. A review of weighbridge records for the period 1st September 2010 and 31st of August 2011 revealed that a total of 5,056 deliveries were made resulting in a total of 10,112 two -way traffic movements. On this basis, the quarry presently makes an AADT contribution of 28 heavy vehicles. This is considered as relatively minor in relation to current AADT levels on the Gwydir highway.

A traffic count undertaken by Gwydir Shire Council between 17 May to 19 August 2011 on Mosquito Creek Road, west of the Gil Gil Creek Road intersection revealed an AADT of 83 with 42 percent heavy vehicles. This corresponds to an AADT of 35 heavy vehicles on this road of which 28 can be attributed to the quarry operation.

An attended traffic count was also undertaken for all vehicles on the intersection of Paramellowa and River Streets, Pallamallawa on the 19th of August 2011. Counts were for the peak periods of 6.00am to 9.00am and 3.00pm to 6.00pm.

This intersection carries the majority of all traffic to and from areas to the north and east of Pallamallawa. During harvest seasons, harvest and contractor traffic predominates. On the day of the count no harvesting was occurring due to damp light rain. The rain meant that there was limited farm related traffic as black soil paddocks become unsuitable for traffic once wet.

The following figures 17 and 18 present the results of the traffic counts. In the morning peak, 16 heavy and 66 light vehicles used the intersection while for the evening peak three heavy and 117 light vehicles used the intersection. During the six hours of the count 19 heavy vehicles and 183 light vehicles used the intersection. For the periods surveyed approximately 10 percent of all vehicles counted were heavy vehicles. The wet weather had significantly reduced farm truck traffic and quarry traffic.

The following figures 17 and 18 present a summary of traffic directions for the observations at Paramellowa and River Streets, Pallamallawa.

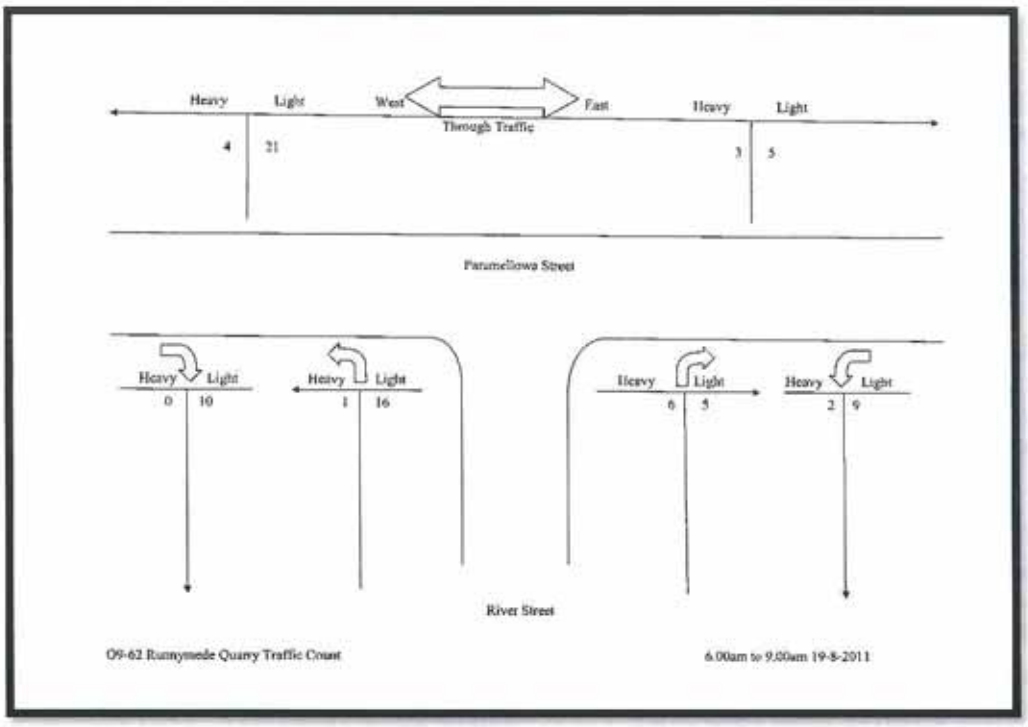


Figure 17 Pallamallawa morning peak traffic

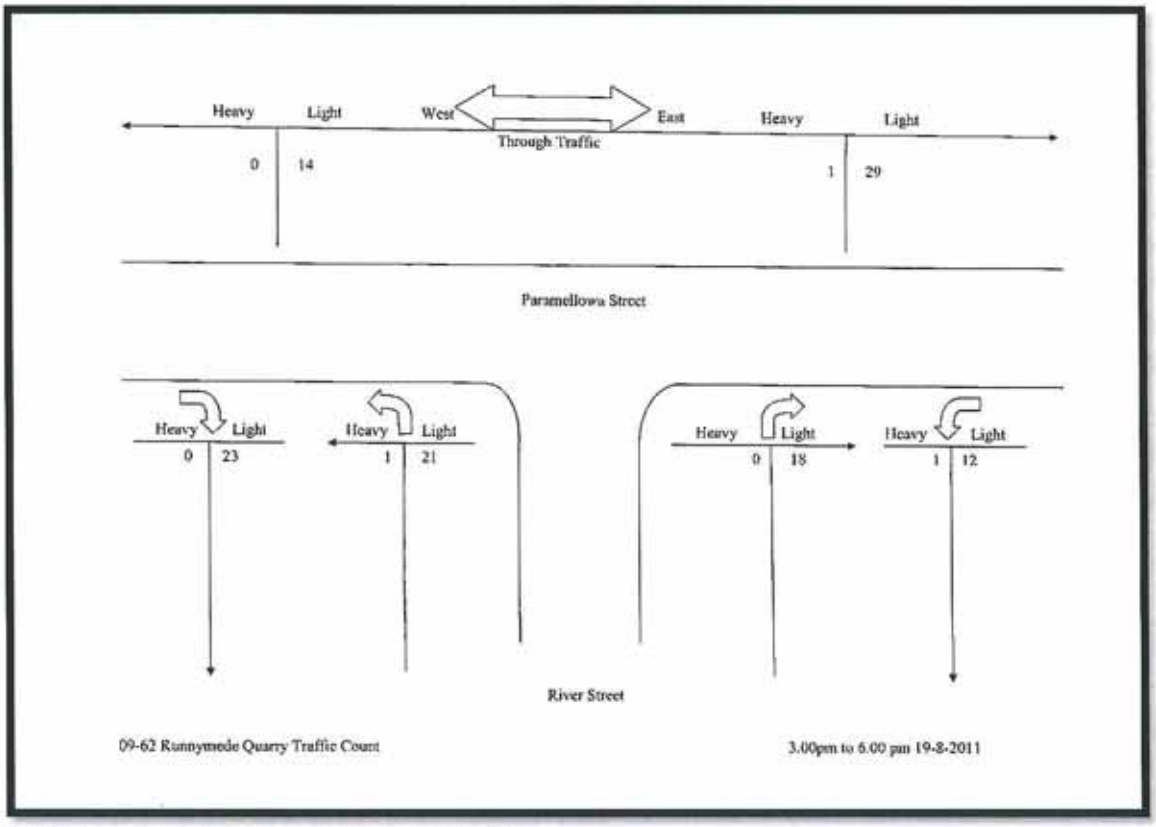


Figure 18: Pallamallawa evening peak traffic

15.1.5 Project related traffic

With the proposed increase in maximum production to 300,000 tonnes per year, some changes would occur in traffic volumes on the roads to be used as haul roads. Based on traffic volumes presented in table 6, the Average Annual Daily Traffic (AADT) volume generated by the quarry would increase as a result of light commercial traffic only, once the road train route through to the quarry is opened. (Work has commenced on this upgrade.)

This following section assesses the impact of the higher AADT of truck and light commercial movements per day that would occur following approval of the increased extraction tonnage. The

AADT generated by the quarry would be in the order of 60 per day, consisting of 18 truck trips and 12 light commercial trips. The trips are two way.
The following Tables taken from Austroads and NSW RMS publications set out intersection and carriageway levels of service for various traffic volumes.

Table 8 Carriageway level of service - Source Austroads

Level of service	Description
A	Free flow (almost no delays)
B	Stable flow (slight delays)
C	Stable flow (acceptable delays)
D	Approaching unstable flow(tolerable delays)
E	Unstable flow(congestion; intolerable delays)
F	Forced flow (jammed)

Table 8 shows that at both present and predicted traffic volumes all roads and intersections would operate at level of service 'A' for all operating scenarios.

Table 9 provides a means of assessing intersection capacity based on lane number and traffic numbers.

Table 9: Intersection Capacity - Uninterrupted Flow Conditions - Source Austroads

Major Road Type[1]	Major Road Flow (v/h)[2]	Minor Road Flow (v/h)[3]
Two-lane	400 500 650	250 200 100
Four-lane	1000 1500 2000	100 50 25

Notes:
1. Major road is through road (i.e. has priority).
2. Major road design volumes include through and turning movements.
3. Minor road design volumes include through and turning movements.

Table 9 indicates that the roads would be classified within the lowest level of a minor road having less than 250 vehicles per hour.

The following table 10 provides a basis for assessing intersection treatments. The roads used on the haul route are considered as "Service A" roads.

Table 10: Intersection level of service - Source: NSW RMS

Level of Service	Average Delay per Vehicle (s/vehicle)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 - 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, required other control mode

Table 10 suggests that the treatment of the intersections involved in the haul roads with give way and stop signs would be considered as acceptable practice in relation to Austroads standards.

15.1.6 Accident Data

Accident figures from the NSW RMS for the Gwydir Highway for the Moree Plains Shire local government area (Biniguy to Walgett) for the ten years between 2001 and 2010 show that there were 65 accidents which included three fatalities for that period. The figures also show a trend that accidents involving trucks continue to reduce over that same ten year period. Recent road safety programs have targeted truck operators and truck standards. This has resulted in a significant improvement in driver behaviour and the standard of trucks, including maintenance, capability and safety.

No accident data is available for the local haul roads.

15.1.7 Truck Type

With production increased to a potential of up to 300,000 tonnes per annum it is expected that the truck fleet would be quickly upgraded to comprise all road trains for bulk haulage of aggregate. Some deliveries may be made on smaller trucks such as B-doubles, single trailers and other smaller configurations, where purchasers use their own trucks to pick up materials or the proponent requires smaller quantities to be delivered to local construction sites.

Road users within Gwydir Shire are at present not familiar with road trains on their local roads other than the occasional passage undetected by authorities. The Safety audit of the haul road within the Gwydir Shire reviewed factors of existing and required road widths to determine whether sections of the road required widening or realignment. The only section requiring realignment consisted of the causeway over Mosquito creek on the Gil Gil creek road. Work has commenced in this widening. The remainder of the road was considered to have sufficient width for road trains.

15.1.8 Road Materials

Mosquito creek road and Gil Gil creek roads are the only sections of the main haul road that remain as gravelled roads. All other roads are bitumen sealed and approved for road train use. Heavier roads would require permits on any of the roads.

Mosquito creek road has no weight restrictions, however the type of gravel placed on the road varies at present from hard rock road base to local gravels. An existing agreement between the proponent and the Gwydir Shire will result in the eventual sealing of this road. This work would involve reconstruction of the existing road base material, re-profiling of the road and placement of hard rock road base subgrade material. The hard rock is to consist of designed road base from Runnymede quarry that meets NSW RMS specifications for bitumen sealed roads. A suitable depth of gravel would be assessed as part of the road design works which would be subject to standard testing of materials.

Regular maintenance occurs on the gravel road sections of the haul road to maintain access to and from the quarry. This maintenance is undertaken as part of an existing agreement between the proponent and the Shire.

15.1.9 Road network maintenance

The Director General required a detailed description of the measures that would be implemented to upgrade and/or maintain the road networks over the life of the project.

The proponent presently contributes one percent of the amount of gravel hauled from the quarry to the Gwydir Shire Council to be used in the maintenance of the haul route under a planning agreement. Council and the proponent have agreed to continue this planning agreement at present. The original agreement has provided some flexibility from the original objectives set in 1995. The agreement now relates to the upgrade of the haul roads within the Gwydir Shire to bitumen sealed roads in addition to allowing the use of road trains to haul gravel. This agreement includes contribution to general maintenance of the roads in the form of provision of materials for the maintenance.

Alternatively, if it is considered preferable, a contribution to the cost of maintenance could be made on a pro-rata basis. Section 75R(4) of the Environmental Planning & Assessment Act 1979 provides that *"Divisions 6 and 6A of Part 4 apply to projects... in the same way as they apply to development and the granting of the consent to the carrying out of the development under Part 4..."*

By reference to Sections 94 and 94B of the Act, a consent authority may impose a condition requiring a proponent to make a contribution towards provision or improvement of amenities or services – so long as that contribution is determined in accordance with a contributions plan.

Gwydir Shire Council has recently exhibited such a plan for public consultation. The plan is yet to be gazetted.

15.1.10Conclusion

The following conclusions are drawn from the road investigations into the proposed increase of output from Runnymede Quarry.

1. Access to the site would remain via a private road from Gil Gil Creek Road;
2. Transport vehicles associated with the quarry are to change from the current use of semi-trailers, B-doubles and smaller trucks to the use of road trains for the majority of product hauled from the quarry.
3. As a result of the increase in load capacity of the trucks, daily truck traffic would remain similar to current levels
4. Light commercial and employee vehicle trips would increase as production increased. The impact of these light vehicles on the road network is considered as minor.
5. A code of conduct has been developed for all drivers employed by the quarry which enhances road safety and public amenity;
6. An audit has been completed on existing traffic at the intersection of River and Paramellowa Streets in the village of Pallamallawa for morning and afternoon peaks and has determined that the intersection functions at level of service 'A' with minimal to no delays recorded;
7. Existing road network operations adjacent to the site are well within the technical capacity limits of the network and operational levels of service will remain good at 'A' for both carriageways and intersections;
8. Accident history for the Gwydir Highway show that safety of the road network is at a satisfactory level and this would not change with the changes of traffic resulting from this proposal;

It can be seen from the above figures that the volume of traffic associated with the quarry, together with the current flows through Pallamallawa and on the Gwydir Highway, will have a minimal impact on the level of service or safety for all road users. The eventual use of road trains to haul gravel from the quarry will maintain heavy traffic to levels that are experienced at present.

15.2 Statutory Matters

Environmental Planning and Assessment Act 1979 and Regulation 2000 – Classification of Development.

A review of current provisions under the Environmental Planning and Assessment Act 1979 and Regulation 2000 identified that the proposed development is not considered as State Significant development in accordance with "State Environmental Planning Policy (State and Regional Development, 2001. The overall tonnage applied for under this application is less than the threshold for a state significant classification.

The proposed development is considered as designated development in accordance with Clause 19 in Schedule 3 of the EP&A Regulations 2000. The development is classified as such as it exceeds the annual extraction threshold of 30,000 cubic metres and proposed to disturb an area greater than 2 Ha.

Under schedule 4A of the EP&A Act, the proposal is considered as Regional development. On this basis the proposal is to be notified and assessed by a Local Council and then determined by a Joint Regional

Planning Panel as defined in schedule 4A of the EP&A Act.

State Environmental Planning Policies
The following presents a review of relevant State Environmental Policies:

State Environmental Planning Policy (Infrastructure) 2007 repealed State Environmental Planning Policy No 11 – Traffic Generating Development. SEPP 11 had classified extractive industries as traffic generating development for the purpose of the policy. This classification of extractive industries was not continued under the infrastructure SEPP and therefore is not applied to this application.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 defines extractive industry and industry and states that an extractive industry is not an industry. The Policy also states that extractive industries are permissible on any land on which agriculture may be carried out. The Policy also sets out a number of matters that must be considered by a consent authority before giving consent to a mine. The Policy also requires a consent authority to consider whether development proposals in the vicinity of existing extractive industries are likely to impact on the extractive industry. These matters have been considered in the previous sections.

State Environmental Planning Policy 33 – Hazardous and Offensive Development applies to industries that are hazardous or offensive or potentially hazardous or offensive. The operation of Runnymede Quarry is not considered as a hazardous industry. The DUAP publication *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* at page 3 sets out the steps to determine if the policy applies to particular development applications. The first step is to determine if the proposed development constitutes an 'industry' under the applicable planning instrument. The Yallaroi Local Environmental Plan 1991 which is the current Local Environmental Plan utilised by the Gwydir Shire for the Runnymede area, adopts the Environmental Planning and Assessment Model Provisions 1980. Clause 4 of the Model Provisions excludes extractive industries from the definition of 'industry' under the LEP. SEPP 33 therefore does not apply to the Runnymede development. However, the quarry does not store potentially hazardous or dangerous goods onsite.

The State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 also excludes extractive industries from the definition of 'industry', therefore, as extractive industries are not 'industries' this SEPP has no application to the proposal.

Protection of the Environment Operations Act 1997
An environment protection licence (EPL) No 7379 under the Protection of the Environment Operations Act 1997 is currently active on the site and provides the conditions of operation and monitoring for the existing operations at Runnymede Quarry. A copy of the current EPL is presented in appendix 3. The current EPL has an administrative threshold of >100,000 to 500,000 tonne for administrative fee purposes. The proposed expansion of the quarry will not exceed this threshold level. However, changes to the operation to enable increased production at the quarry will require amendments to the EPL in relation to operating times and other matters.

The review of the application is to include an assessment by the Office of Environment and Heritage in relation to the proposed increase in production and Licence conditions for the quarry. Once the application reaches a stage where an approval is to be provided by the Joint Regional Planning Panel, an application would be lodged with the Office of Environment and Heritage if amendments are required to the EPL.

Yallaroi Local Environmental Plan 1991
The subject land is zoned 1(a) (General Rural) and extractive industries are permitted in the general rural zone under the LEP. The existing operations at the quarry have been approved under the provision of this plan.

Copies of the two existing development consents are presented in appendix 5.

Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is a Commonwealth Government Act governing nationally significant matters of the environment. The EPBC Act requires the approval of the Commonwealth Minister for the Environment for actions such as major developments that are considered by the Minister to have a significant impact on matters of national environmental significance. The EPBC Act requires a referral of all potentially significant developments to the Minister for consideration.

The proposal was referred to the Commonwealth Minister for the Environment for consideration and advice. The Minister has advised that the proposal is not a controlled action and that further assessment or approval under the Act is not required. The response from the Minister is attached as Appendix 4.

15.3 Air and Dust impacts

Dust is one of the most visible impacts for extractive industries and its visibility often raises concerns which often exceed its impact on health and the environment. Dust emissions in extractive industries result from blasting, handling, processing or transporting the extracted materials.

In a rural environment, such as that surrounding the Runnymede quarry, dust emissions also result from farming operations such as land clearing, cultivating, sowing, fertilising, chemical spraying, harvesting, livestock operations and transportation of commodities on unpaved roads. Dust emissions on rural land also result from wind blowing across bare paddocks or unpaved roads.

Dust concentrations and therefore deposition rates and potential impacts tend to decrease rapidly away from the source. In the case of Runnymede quarry the extractive operation represents a single localised dust source within a much more dispersed agricultural dust source.

Canadian research[1] determined the following dust emission percentages for Canadian agriculture. No similar research is available in Australia.

Table 11: Dust from agricultural activities after Pattey, E., G. Qiu and R. van Haarlem

Source	Percentage
Wind erosion	50%
Land preparation	28%
Harvest	16%
Pollen	2%
Animal feeding	2%
Grain handling	1%
Crop residue burning	1%

There are great similarities between Canadian and Australian agriculture, thus it is apparent that Runnymede quarry may operate in a dusty environment as it is surrounded by agricultural activity to the west.

Dust emissions from quarries are influenced by the:

- disturbed surface area;
- type of material being extracted and handled
- quantity of material being extracted;
- method of extraction;
- quantity of material being processed;
- method of processing; and
- local meteorology.

[1] Pattey, E., G. Qiu and R. van Haarlem. *Agricultural Particulate Matter Emissions Indicator http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1295987784501&lang=eng*

In relation to the present application to increase annual production from Runnymede quarry, the total quantity of material to be extracted, processed and removed from the site would be increased from the current limit of 120,220 tonne to a maximum annual tonnage of 300,000. The material being extracted, method of extraction, weather and processing methods would remain the same. The annual tonnage may increase by more than two fold thus increasing the duration of the extraction process and the duration of times for haulage of the material away from the site.

As part of the existing Environmental Management Plan and management protocols to investigate complaints relating to the quarry operations, SMK Consultants undertook an extended period of dust deposition analysis to quantify dust deposition from the quarry and dust deposition relating to road use near the residence on the property of "Billandrie".

Discussions were held with EPA and Gwydir Shire in relation to the type of dust complaints, the location of these complaints and the identify cause of the complaints. The complaints could be separated into two issues. Issue 1 relating to visible dust emissions directly from the secondary crusher and sieve operations. Issue 2 related to road generated dust from haulage operations and other road users of the two gravel roads adopted as the main haul roads from the quarry. Two strategically placed dust deposition gauges were installed to provide data to quantify dust deposition occurring near the quarry and dust deposition relating to road and other dust generated in the area.

NSW EPA Guidelines present recommended annual averages and maximum increases in deposited dust levels. The values are based on estimates for rural areas as little or no actual data is available outside of major Coal mining areas or metropolitan centres. The criteria presents recommendations based of health effects and data from eastern areas only and do not appear to reflect actual data for rural areas.
The primary parameter considered for dust deposition is ***insoluble solids***. The remaining parameters refer to various organic and mineral portions of the dust deposited in the gauge. The samples are also filtered (if water present) and sieved to remove larger particles in the deposit such as insects, sticks and grass.

The following table 12 presents recommended dust deposition criteria established under these guidelines.

Table 12: NSW Dust deposition Criteria

Parameter	Averaging Period	Maximum total deposited dust level	Maximum increase in deposited dust level
Deposited dust	Annual	Max 4 g/m^2/month	2 g/m^2/month

(Source: DEC (2005) 'Approved Methods & Guidance for the Modelling and Assessment of Air Pollutants in NSW', Table 7.1 pg.28.)

Sample site 1 was located approximately 560m in a southwest direction from the secondary crusher at Runnymede quarry and on the boundary of the property. This site receives dust from the quarrying operation including the crusher, road dust and quarry dust. It has been located on a direct line between the crusher and sampling site 2 and directly in the path of prevailing northeasterly winds.

Sample site 2 was located in the garden bed adjacent to the residence on the property of Billandrie. The occupants of Billandrie homestead had lodged numerous complaints to DECCW and Gwydir Council in relation to dust. (It should be noted that the property of Billandrie is now owned and used as a primary residence by the Proponent) The aim of locating the dust deposition gauge at the Billandrie house was to quantify the level of dust. The gauge was located approximately 445 m and 20 m in elevation above Mosquito creek road and approximately 6200 m southwest of the quarry operation.

Dust monitoring using the deposition gauges was undertaken monthly in accordance with the method set out in AS/NZ 3580. Monitoring was undertaken between 2009 and extended into 2010 and analysis of the dust gauges was undertaken by NATA registered laboratories. The results for dust gauge 1 are presented in Table 13.

Table 13: Dust deposition monitoring results for Runnymede Quarry in g/m²/month

Month	Total solids	Insoluble solids	Soluble solids	Combustible matter	Ash	Mineral dust
November		**2.7**				
December		**3.3**				
January	6.3	**1.3**	5.0	0.13	1.2	0.1
February	7.0	**1.3**	5.7	0.10	1.2	0.1
March	4.7	**1.6**	3.1	0.39	1.2	0.4
April	0.97	**0.8**	0.16	0.76	0.05	0.3
May	4.0	**2.2**	1.8	0.92	1.3	0.9
June	4.0	**0.75**	3.2	0.32	0.44	0.31
July	4.6	**1.1**	3.5	0.23	0.88	0.22
August	4.7	**0.88**	3.8	0.29	0.6	0.28
Average		**1.59**			0.86	0.33

The average insoluble dust level of 1.59 g/m²/month is well below the maximum of 4g/m²/month. Dust levels ranged from a low of 0.8 to a high of 3.3. Quarry activity was relatively constant throughout this period of monitoring.

The results indicate that the average ash content forms the majority of the insoluble solids. This ash is combustible material and not mineral or soil material from the quarry. There are no spikes or peaks to indicate intense periods of emissions or periods where quarry management failed to manage dust emissions adequately.

"Billandrie" homestead is located upslope of Mosquito Creek Road and surrounded by cropping and grazing activities. The land between the road and the homestead mainly consists of open grazing land that was once cultivation land. The house is approximately 6200 m directly southwest of the quarry and directly downwind for the common northeasterly morning winds. Farming activities are undertaken on "Billandrie" and on surrounding farmland. Mosquito creek road forms a primary arterial road service the local farming area and the quarry. The gauge was looked after by the original residents of Billandrie who had made complaints to SMK Consultants in relation to road dust and quarry dust.
The following table presents the results of dust monitoring at "Billandrie".

Table 14: Dust deposition monitoring results for "Billandrie" homestead in g/m²/month

Month	Total solids	Insoluble solids	Soluble solids	Combustible matter	Ash	Mineral dust
November		**13.2**				
December		**1.8**				
January	5.0	**1.3**	3.7	0.18	1.1	0.2
February	4.4	**1.6**	2.8	0.110	1.5	0.1
March	4.2	**0.97**	3.2	0.24	0.72	0.25
April	2.9	**0.82**	2.1	0.58	0.24	0.58
May	4.7	**2.3**	2.4	1.4	0.87	1.43
June	3.7	**0.62**	3.0	0.33	0.29	0.33
July	2.5	**0.56**	2.0	0.26	0.30	0.26
August	4.5	**0.67**	3.8	0.15	0.52	0.15
Average		**2.38**			0.69	0.41

The dust data for Billandrie shows an initial spike level of 13.2 g/m^2/month. This is a highly unusual spike that cannot be explained by analysis of wind, excessive road use on Mosquito Creek road or busy farming activity potentially linked to grain harvest. The results were prepared by a NATA registered laboratory who failed to report parameters other than total insoluble solids. The result could therefore not be analysed in more detail.

Analysis of all other results indicated an average insoluble dust level of 2.38 g/m^2/month which is below the recommended maximum of 4 g/m^2/month and slightly higher than the dust gauge at Runnymede. The larger proportion of analysed dust again consisted of ash which is organic matter. The mineral dust content varied from month to month.

For both monitoring locations the atmospheric levels of insoluble solids are well below the 4 g/m^2/month recommended level. Some variations occur in the content of the dust in relation to ash and mineral content indicating various sources of dust in the sampling. No significant pattern could be identified in these variations to indicate whether the dust was generated from the quarry, farming activity or road dust. However, the rolling averages suggest that the dust has a higher organic content than mineral content. The organic content is generated from mainly farming activity. The mineral content is also generated from farming activity but added to by road dust and potentially quarry dust.

The monitoring was undertaken to quantify deposited dust rates in the quarry area. The monitoring was undertaken over an extended period to capture variations in quarrying activity and variations in local farming activity. The results are relatively similar throughout the monitoring period and therefore monitoring equipment was moved to other locations in the Moree Plains Shire to obtain extended periods of deposited dust data.

PM 2.5 and PM 10

Monitoring for PM 2.5 and PM 10 was undertaken at the nearest sensitive receiver to the quarry, being the "Kirkton" homestead. This was undertaken as a result of concerns raised by EPA in relation to the operation of Runnymede quarry and matters raised under the current EPL.

Monitoring was undertaken using a DustTrak II Model 8532 real-time monitor and the results are set out below. Tables 15 and 16 present PM 2.5 and PM 10 data respectively.

Table 15: Dust monitoring at Kirkton for PM 2.5

Instrument Name	DustTrak II
Model Number	8532
Serial Number	8532094102
Firmware Version	2.7
Calibration Date	10/02/2012
Test Name	MANUAL_002
Test Start Time	9:43:21 AM
Test Start Date	14/03/2012
Test Length [D:H:M]	1:00:00
Test Interval [M:S]	15:00
Mass Average [mg/m3]	**0.003**
Mass Minimum [mg/m3]	0
Mass Maximum [mg/m3]	0.008
Mass TWA [mg/m3]	0.002
Photometric User Cal	1
Flow User Cal	1
Errors	

Number of Samples	96

Table 16: Dust monitoring at Kirkton for PM 10

Instrument Name	DustTrak II
Model Number	8532
Serial Number	8532094102
Firmware Version	2.7
Calibration Date	10/02/2012
Test Name	MANUAL_001
Test Start Time	10:20:38 AM
Test Start Date	13/03/2012
Test Length [D:H:M]	0:23:15
Test Interval [M:S]	15:00
Mass Average [mg/m3]	**0.006**
Mass Minimum [mg/m3]	0.002
Mass Maximum [mg/m3]	0.02
Mass TWA [mg/m3]	0.005
Photometric User Cal	1
Flow User Cal	1
Errors	
Number of Samples	93

"Kirkton" is a grain and cattle farming property located approximately 3.1 kilometres west-north-west from the quarry and the homestead is the nearest sensitive receiver to the quarry and the closest source of 240 V power available outside of the Runnymede property to run the instrument. The monitoring was undertaken over two 24-hour periods on the thirteenth and fourteenth of March 2012. Test intervals were set at 15 minutes and then automatically averaged over the 24-hour period. Weather data was available from the Moree BOM station 053115 which showed that the weather on both days was fine with no rain and winds from the east northeast to east southeast varying between seven to 15 kilometres per hour, temperature ranged from 17 to 31.1 degrees. The general wind pattern pushed the air flow from the quarry toward Kirkton and therefore the monitoring site was considered suitable for assessment of dust emissions from the quarry.

Runnymede Quarry was operating normally during the measurement period. Minimal other activity was occurring in the area.

PM-2.5 concentrations averaged 3 micrograms per cubic metre with a maximum of eight and a minimum of zero over the 24-hour period. PM-10 concentrations averaged 6 micrograms per cubic metre with a maximum of 20 and a minimum of two over the 24-hour period.
These concentrations are within the criteria set by the National Environment Protection Council and reproduced in the publication *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* as presented in table 17.

Table 17: NSW Ambient Air Quality Criteria from NEPC (Air NEPM) and NSW EPA

Pollutant	Averaging period	Concentration µg/m^3	Source
PM_{10}	24 hours	50	NEPC
	Annual	30	EPA (1998)
$PM_{2.5}$	24-hours	25	NEPC
	Annual	8	NEPC

The data from this air monitoring provides real-time ambient air monitoring during normal operations at the quarry. The data was obtained from the closest residence. Results indicate that ambient dust levels are well within Guideline criteria and that no spikes occurred to indicate issues with site management. Observation of the quarry during the monitoring period indicated that site management undertook the normal daily practises as outlined in the environmental management plan (EMP). A copy of the EMP is presented in appendix 8.

15.3.1 Dust Emission Predictions

Concerns were raised that the additional operating hours could increase dust emissions from the site and have an impact on ambient air quality. In order to assess this potential impact, an assessment methodology using NPI Emission Estimation Technique Manual for Mining (version 3.1, January 2012) (the Manual) was adopted. The quarry operation is considered as mining and therefore this standard approach is considered acceptable.
The investigation used the emission factors contained in the Manual. (Equation 1, page 12) Emission factors relate the quantity of a substance emitted from a source to various measures of activity associated with the source.

Equation 1:

$$E_{i\left(\frac{kg}{yr}\right)} = \left[A_{\left(\frac{t}{h}\right)} \times OP_{\left(\frac{h}{yr}\right)}\right] \times EF_{i\,l\left(\frac{kg}{t}\right)} \times \left[1 - \frac{CE_i}{100}\right]$$

Where:

$E_{i\,(kg/yr)}$	= emission rate of pollutant i, kg/yr
$A_{\,(t/h)}$	= activity rate, t/h
$OP_{\,(h/yr)}$	= operating hours, h/yr
$EF_{i\,l(kg/t)}$	= uncontrolled emission factor of pollutant i, kg/t
CE_i	= overall control efficiency for pollutant i, kg/t

The equation is used to estimate hourly and annual emission rates from a mining type activity using various factors such as rate of activity, duration of activity, control of the activity in relation to emission prevention measures and type of material being mined or processed on the site. Default emission factors are drawn from tables 2 and 3 of the Manual. Emission reduction efficiencies are drawn from table 4 of the Manual.

The calculations for TSP and PM_{10} are separated in the calculations to provide more detailed predictions of dust emissions. Calculation of emissions used in this methodology relies upon two primary parameters, mainly annual operating hours and tonnes produced.

The quarry is presently approved to operate from 7 am to 5.30 pm, Monday to Friday. Allowing for 10-days of public holidays where operations are not presently occurring, the quarry can operate for a period of 2,625 hours per year. This does not allow for wet days. The proposed operation would increase to a potential of 3,322 hours per annum for loading and despatch of gravel material. The loading and despatch of materials from the site is considered as the largest potential source of dust emissions. However, secondary crushing operations would occur for the same hours and is similarly exposed as a potential source of dust emissions.

The proposed operating hour parameters have included some minor allowances for truck operating times to allow for site delays such as mechanical problems or late arrivals in the working day. The reason for such allowances is to avoid sending empty trucks from the site if such delays occur where the empty truck would contribute to emissions but would need to return to the site the following day.
It should be noted that this application involves an increase in annual production. To achieve this, operating hours and production rates would need to increase. Production rates will increase by use of the existing available capacity of equipment on the site. This application does not include a change of machinery. Production would be subject to peaks to meet short deadlines. It would also be subject to

periods where production ceases as a result of stockpiling of materials during peak production periods and delays in contractual delivery times in addition to cessation of operations during wet weather. Calculation of emission rates assumes production figures to be at the maximum approved rate. This is proposed as 300,000 tonne per year. The following table presents are summary of the operating hours and rates of production for the three categories of operations on the site.

Table 18: Summary of production and operating hours for existing and proposed activity at Runnymede Quarry

Category of Activity	Annual Operating Hours (hours per year)		Average Production Rate (tonne per hour)	
	Current	Proposed	Current	Proposed
In-Pit Operations	2,626	4,004	46	75
External Pit Operations	2,626	3,322	46	90
Transport Operations	2,626	3,322	46	90

These operating hours and production rates have been used in the following tables to determine potential dust emission rates from operations at the quarry.

Table 19: Calculation of Emission rates for In-Pit Operation

Proposed			Existing		
Excavators, shovels, front end loaders on overburden - TSP					
A (t/h)	75	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3952	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.025	uncontrolled emission factor of pollutant I, kg/t	EFi (kg/t)	0.025	uncontrolled emission factor of pollutant I, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	3705	emission rate of pollutant i, kg/y	Ei (kg/y)	1509.95	emission rate of pollutant i, kg/y
Ei (kg/h)	0.9375	emission rate of pollutant i, kg/h	Ei (kg/h)	0.575	emission rate of pollutant i, kg/h
Excavators, shovels, front end loaders on overburden -PM10					
A (t/h)	75	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3952	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.012	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.012	uncontrolled emission factor of pollutant I, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	1778.4	emission rate of pollutant i, kg/y	Ei (kg/y)	724.776	emission rate of pollutant i, kg/y
Ei (kg/h)	0.45	emission rate of pollutant i, kg/h	Ei (kg/h)	0.276	emission rate of pollutant i, kg/h
Primary crushing high moisture content material - TSP					
A (t/h)	75	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3952	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.01	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.01	uncontrolled emission factor of pollutant i, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	1482	emission rate of pollutant i, kg/y	Ei (kg/y)	603.98	emission rate of pollutant i, kg/y
Ei (kg/h)	0.375	emission rate of pollutant i, kg/h	Ei (kg/h)	0.23	emission rate of pollutant i, kg/h
Primary crushing high moisture content material - PM10					
A (t/h)	75	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3952	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.004	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.004	uncontrolled emission factor of pollutant i, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	592.8	emission rate of pollutant i, kg/y	Ei (kg/y)	241.592	emission rate of pollutant i, kg/y
Ei (kg/h)	0.15	emission rate of pollutant i, kg/h	Ei (kg/h)	0.092	emission rate of pollutant i, kg/h

Table 20: Calculation of Emission rates for External Pit Operations

Proposed			Existing		
Excavators, shovels, front end loaders on overburden - TSP					
A (t/h)	90	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3550	operating hours, h/y	OP (h/y)	2626	operating hours, h/yr
EFi (kg/t)	0.025	uncontrolled emission factor of pollutant I, kg/t	EFi (kg/t)	0.025	uncontrolled emission factor of pollutant I, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	3993.75	emission rate of pollutant i, kg/y	Ei (kg/y)	1509.95	emission rate of pollutant i, kg/y
Ei (kg/h)	1.125	emission rate of pollutant i, kg/h	Ei (kg/h)	0.575	emission rate of pollutant i, kg/h
Excavators, shovels, front end loaders on overburden - PM10					
A (t/h)	90	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3550	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.012	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.012	uncontrolled emission factor of pollutant I, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	1917	emission rate of pollutant i, kg/y	Ei (kg/y)	724.776	emission rate of pollutant i, kg/y
Ei (kg/h)	0.54	emission rate of pollutant i, kg/h	Ei (kg/h)	0.276	emission rate of pollutant i, kg/h
secondary crushing high moisture content material - TSP					
A (t/h)	90	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3550	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.03	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.03	uncontrolled emission factor of pollutant i, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	4792.5	emission rate of pollutant i, kg/y	Ei (kg/y)	1811.94	emission rate of pollutant i, kg/y
Ei (kg/h)	1.35	emission rate of pollutant i, kg/h	Ei (kg/h)	0.69	emission rate of pollutant i, kg/h
secondary crushing high moisture content material - PM10					
A (t/h)	90	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3550	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.012	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.012	uncontrolled emission factor of pollutant i, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	1917	emission rate of pollutant i, kg/y	Ei (kg/y)	724.776	emission rate of pollutant i, kg/y
Ei (kg/h)	0.54	emission rate of pollutant i, kg/h	Ei (kg/h)	0.276	emission rate of pollutant i, kg/h

Table 21: Calculation of Emission Rates for Transport Operations

Proposed			Existing		
Excavators, shovels, front end loaders on overburden - TSP					
A (t/h)	90	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3275	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.025	uncontrolled emission factor of pollutant I, kg/t	EFi (kg/t)	0.025	uncontrolled emission factor of pollutant I, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	3684.375	emission rate of pollutant i, kg/y	Ei (kg/y)	1509.95	emission rate of pollutant i, kg/y
Ei (kg/h)	1.125	emission rate of pollutant i, kg/h	Ei (kg/h)	0.575	emission rate of pollutant i, kg/h
Excavators, shovels, front end loaders on overburden - PM10					
A (t/h)	90	activity rate, t/h	A (t/h)	46	activity rate, t/h
OP (h/y)	3275	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
EFi (kg/t)	0.012	uncontrolled emission factor of pollutant i, kg/t	EFi (kg/t)	0.012	uncontrolled emission factor of pollutant I, kg/t
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	1768.5	emission rate of pollutant i, kg/y	Ei (kg/y)	724.776	emission rate of pollutant i, kg/y
Ei (kg/h)	0.54	emission rate of pollutant i, kg/h	Ei (kg/h)	0.276	emission rate of pollutant i, kg/h
Truck on haul road - TSP					
Default TSP factor	4.23	kg/vehicle kilometre travelled (kg/VKT)	Default TSP factor	4.23	kg/vehicle kilometre travelled (kg/VKT)
OP (h/y)	3275	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
Distance km	1	Distance travelled on haul road	Distance km	1	Distance travelled on haul road
Truck movements	10112	Total number of vehicle movements per year	Truck movements	10112	Total number of vehicle movements per year
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	21386.88	emission rate of pollutant i, kg/y	Ei (kg/y)	21386.88	emission rate of pollutant i, kg/y
Ei (kg/hr)	6.530345	emission rate of pollutant i, kg/h	Ei (kg/h)	8.14428	emission rate of pollutant i, kg/h
Truck on haul road - PM10					
Default TSP factor	1.25	kg/vehicle kilometre travelled (kg/VKT)	Default TSP factor	1.25	kg/vehicle kilometre travelled (kg/VKT)
OP (h/y)	3275	operating hours, h/y	OP (h/y)	2626	operating hours, h/y
Distance km	1	Distance travelled on haul road	Distance km	1	Distance travelled on haul road
Truck movements	10112	Total number of vehicle movements per year	Truck movements	10112	Total number of vehicle movements per year
CEi	50	overall control efficiency for pollutant i, kg/t	CEi	50	overall control efficiency for pollutant i, kg/t
Ei (kg/y)	6320	emission rate of pollutant i, kg/y	Ei (kg/y)	6320	emission rate of pollutant i, kg/y
Ei (kg/h)	1.93	emission rate of pollutant i, kg/h	Ei (kg/h)	2.41	emission rate of pollutant i, kg/h

Emissions from fuel combustion and explosives use were not considered as these are considered as a relatively minor emission from the site. The material quarried on this site is considered as "high moisture material" in accordance with the Manual (Page 62). Average moisture content of the raw material ranges between 5 and 6 percent under normal conditions. This increases as a result of rain. Moisture is also added to the material during processing for dust management and manufacture of gravel blends.

The above tables enable the calculation of accumulative dust emission levels. The existing cumulative TSP and PM10 hourly emission rates are calculated to be in the order of 10.8 kg/h and 3.6 kg/h respectively. Under the proposed production rates, the cumulative hourly TSP and PM10 dust emission rates are 11.44 kg/h and 4.15 kg/h respectively. These calculations predict an increase of 6 percent and 15 percent respectively.

The annual TSP and PM10 emission rates for the existing operation are predicted to be 28.333 t and 9.45 tonne respectively. For the proposed increase in production, the annual TSP and PM10 calculations for emission rates predict totals of 39.04 t and 14.3 t respectively, the current management efficiencies remain at 50-percent.

Dust emissions from the site are generated from an area of approximately 27.3 Ha at present. This is based on potential dust generation from the whole of the disturbed area. As the quarry progresses, the working area that is to be disturbed on a daily basis would remain similar in size. Areas within the quarry that have been exhausted of material would be either remediated or used as stockpiles for raw or spoiled material. The potential dust generation from these areas in the form of wind borne dust is considered as minor. The above calculations assess the working areas only.

The major contributor to emissions is from transport operations. An overall control efficiency factor of 50 percent was used in the above calculations. A 10-percent improvement in overall control efficiency in the above tables predicts a 25-percent reduction in TSP and PM10 dust emissions. In order to maintain the current level of dust emission from existing activity, using the above methodology for dust emission calculations, a minimum improvement of 6.5 percent in overall dust control efficiency would be required.

Further analysis of this for the major contributing activity, transport, indicates annual existing emissions totalling 22.897 t and 7.045 t for TSP and PM10 respectively. If the operation continues with a 50-percent level of overall control efficiency for management of dust, this would increase to 24.334 t and 8.089 t for TSP and PM10 respectively.

To maintain or decrease the current level of TSP emissions from transport operations, calculations indicate that an overall reduction of 10.771 tonnes per annum is required for the proposed higher level of activity. Using the above table 21 for "truck on haul road", the 10.771 reduction can be achieved by increasing control efficiency by 17 percent to 67 percent rather than the assumed 50 percent. If this can be achieved, the TSP dust emissions from the site would be limited to 14.11 t per annum.

For PM10 dust, the same calculations applied for transport on the haul roads for the larger number of trucks, indicates that a control efficiency level of 74 percent would be required to reduce the PM10 dust emissions down to a level of 3.286 t per annum as against a potential of 6.32 t if a control efficiency of 50 percent is maintained.

Management could achieve these improvements by dust management by maintaining stringent adherence to the dust suppression program as outlined in the EMP. Alternatively, a

similar reduction can be achieved by reducing the length of gravel haul road within the site. Using table 21, a reduction from 1000m to 500m in haul road distance can limit dust emissions to current levels when the production rate is increase. An option to achieve this alternative is to seal approximately 500 m of the gravel haul road within the quarry area. This is the equivalent distance from the front entrance grid to the first sediment dam. This option would impose a significant cost burden but remains as an option if the required improvements in overall dust control efficiencies cannot be achieved by conventional road watering activity.

15.3.2 Dust management strategies

Current dust management strategies used on Runnymede involve the application of water by fixed sprays on the crushing and screening plant and by the use of a water truck to apply water to internal roads, stockpiles and the active pit floor. The water is applied when activity is permitted on the site. At present this is restricted by the EPL between 7am and 5.30pm Monday to Friday. No watering can is undertaken outside of these hours without a breach occurring under the conditions of the EPL. Due to this issue, some potential exists for wind borne dust to be generated on the site outside the current operating hours. An application to modify these hours has been lodged with Gwydir Shire Council to enable management to resolve this issue of wind borne dust and truck generated dust.
The monitoring of deposited dust and ambient dust levels in the local area has indicated that the quarry is complying with NSW dust emission criteria. The current management strategy is therefore adequate.

The quarry operation relies upon surface water runoff collected in sediment basins and catch dams for water to be applied under the dust suppression program. Additional water is available under extreme circumstances from the domestic bore currently used at the residence as a potable water supply. In order to assess the requirements and availability of surface water for the dust suppression proposal, the following sections provide an analysis to determine the available water on the site and water requirements program if it is extended as a result of extended production volume.

15.4 Site water balance

Introduction

This section reviews available water storage against water availability to present a water balance for the Runnymede Quarry in order to determine whether management can meet the intended dust suppression strategy. The water balance is provided for average, wet and dry years (10th, 50th and 90th percentile rainfall years).

The Study Area can be divided into six catchments mainly, 1A, 1B, 2 and 3, 4 and 5. Catchment 1B is considered a clean water catchment, with the runoff generated in this catchment to be diverted around the active extraction area and off site via natural drainage depressions. Catchments 1A, 2, 3, 4 and 5 are dirty water catchments, encompassing the product stockpiling area, surge stockpile area, active extraction area and the area just to the south of the extraction area.

The following figure 19 provides an aerial image showing the major internal catchments at the quarry. These catchments were divided on the basis of the sediment control structures that have been constructed for the existing quarry operations. Additional external catchments are available.

The gully dam to the south of the quarry has a catchment area of approximately 175 Ha. The stream is considered as a second order stream and therefore the storage that is on this watercourse is permissible. The total property area is approximately 640 Ha. The property

has legal access to Harvestable Right under the Water Management Act 2000 to utilise approximately 0.065 ML/Ha of runoff which is equivalent to 41.6 ML per annum. This is considered to be in addition to the required sediment pond system as outlined in the EPL. This harvestable right water can be captured in dams and utilised for industrial purposes, such as a dust suppression program. The annual water use is allowed to average at a total of 300 percent of the annual permissible level over any three year period. On this basis, if a dry year occurs where larger volume of dust require the use of more than 41.6 ML, this is still considered permissible if only a total of 124.8 ML is used in any three year period.

Rainfall/Runoff

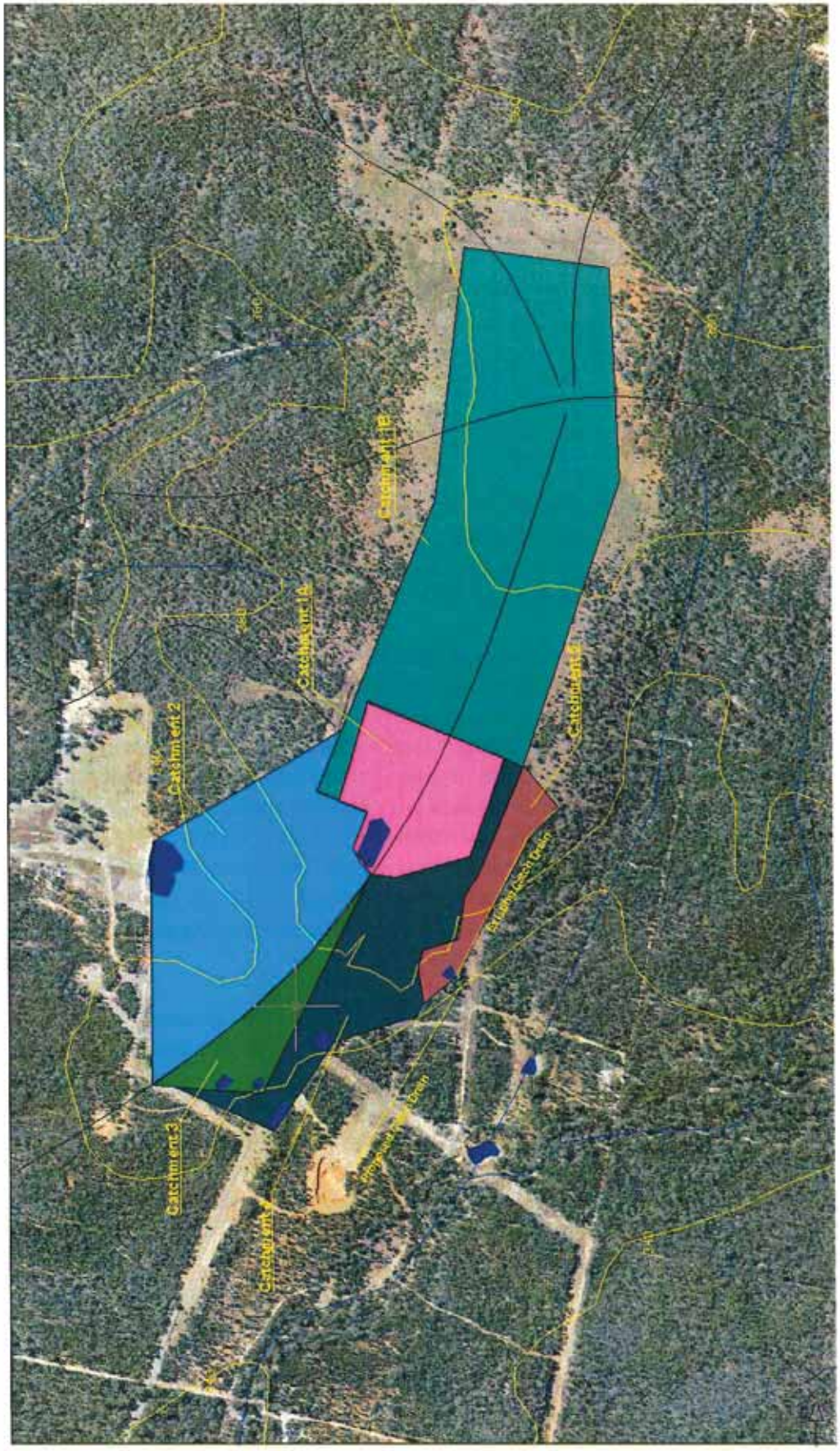
The water balance considers rainfall and runoff generated during low (annual 10th percentile), average (annual 50th percentile) and high (annual 90th percentile) rainfall years. The rainfall data has been obtained from the Bureau of Meteorology monitoring station at Warialda Post Office (station 054029), which is considered to be the most representative of the development site. Rainfall is as follows.

- Annual 10th percentile (dry year): 448.2 mm
- Annual 50th percentile (average year): 677.8 mm
- Annual 90th percentile (wet year): 935.4 mm

Rainfall is summer dominant although rainfall is generally present in all months.
As discussed above, runoff generated in clean water catchment 1B would be directed around the active extraction area. Runoff generated within the disturbed catchments would be directed to sediment basins and gully dams. The sediment basins are to be used as the first source of water so that the dams are drained and then recapture internal runoff. The capacity of these sediment ponds will be maintained to ensure they meet the sedimentation requirements.

A runoff coefficient of 0.45 has been estimated for the clean water catchment 1B which consists of undisturbed pasture. Dirty water catchment 1A is estimated at 0.8 as the floor of the pit contains significant areas of unbroken basalt underlain by sandstone. Runoff coefficients for catchments 2, 3 and 4 are have been estimated as 0.51 as they have been disturbed and surfaced with crushed aggregate which allows infiltration and impedes runoff velocity. Catchment 5 has also been estimated as 0.51 although it remains vegetated and contains significant areas of sandy soil which facilitates infiltration.

Figure 19: Aerial photo showing approximate internal catchments



The gully dam catchment to the south of the site consists of relatively natural undisturbed rocky and steep country. The runoff coefficient for this land is considered as relatively high and in the order of 0.6.

Daily rainfall data for Warialda from 1889 to 2002 was modelled through the USDA rainfall runoff model with a KII index of 83.2 for catchment 1B and 93.9 for the internal quarry catchments combined. The model predicts potential runoff yield from each rainfall event based on the previous 7-days of rainfall.

Table 22: Average annual runoff per catchment in ML

Catchment	Area ha	Average	Maximum	Minimum	10 percentile wet year	50 percentile wet year	90 percentile wet year
Clean water catchment							
1B	27	16	78	0	2	14	32.7
Dirty water catchments							
1A, 2,3,4,5	33.5	53	154	7	19.3	50.5	90.8
Total		69	232	7	21.3	64.5	123.5

Table 22 presents the potential yield from the catchments available within the quarry area. Total storage capacity with all sediment ponds and catch dams is in the order of 20 ML. In an average rainfall year, the storages have the potential of filling three times and therefore maximum potential yield is in the order of 60 ML if the water is used between fills.

No groundwater is expected to be intersected during the extraction operation. Some minor seepage occurs in the quarry area after rainfall as a result of fractures in the rock that hold water after a rainfall event. Groundwater seepage has therefore not been included as an input to the water balance, as it is assumed that any water pooling in the active extraction area would be a result of runoff after a rainfall event and this water would naturally drain to the sump in the northwest corner of the extraction area. Runoff entering the extraction area is accounted for in the runoff calculations for Catchment 1A as it is recoverable when required. This Surface Water Assessment has reviewed the storage dams and the quarry sump. It is assumed that the only loss from the dams would be evaporation as all dams are sealed and hold water to an acceptable level. Evaporation losses have been calculated as the direct evaporation from the surface of the dams and the sump.

The nearest rainfall BOM station to the development site is at the Warialda Post Office. This station does not collect evaporation data. Mean evaporation data was therefore obtained from the Moree BOM station (No. 053048), with the average yearly evaporation being 2,044 mm. The evaporation loss from the water storage dams has been calculated as follows:
Evaporation loss = Dam surface area x average yearly evaporation x 0.7.

It is estimated that the water storage dams and quarry sump would have a combined average surface area of 9,667m^2. A factor of 0.7 has been used to account for variations in the water level in the dams, and to account for the dams not always being full.

The combined annual average evaporation from the on-site dams and sump is therefore estimated at 13.83 ML. Average evaporation rates have minimal variation from year to year and therefore the evaporation loss is general constant.

On this basis, the annual water availability on the site is presented below:

Table 23: Annual water available from internal quarry catchments

Description	Average	10-percentile	90-percentile

ML per Annum Available from main storages	55	8	110

Table 19 does not include the gully storage to the south. The potential yield from this harvestable right catchment was calculated to be in the order of 80 ML per annum average. The 10-percentile and 90-percentile yields ranged from 7 ML to 167 ML respectively. The storage holds approximately 12 to 15 ML at full capacity. The storage provides back-up water to the main system when required.

Dust Suppression
Dust suppression would consist of two main components:

- Mist sprays in the secondary crushing and sieving plant and
- Road watering.

The secondary crushing and sieving plant is fitted with misting sprays that can be used if the gravel material being processed is dry and generating dust. The sprays operate the majority of the time during crushing and sieving unless the moisture content of the raw material is elevated as a result of rain. The misting sprays aim to wet the finer particles that tend to carry further from the plant. Heavier particles travel shorter distances. The rock being crushed is relatively clean as it does not include any dirt particles. The finer dust is generated from the crushing process. The process aims to maximise the recovery of the crushed rock and therefore aims to minimise losses to windblown dust during the sieving or crushing phases where the rock is transferred by conveyor. The misting sprays apply only a fine amount of water into the stream of process materials as it is stockpiled or transferred within the sieving process.

Road watering is generally undertaken when site operations are occurring and only ceases as a result of rain. The majority of the roads utilised by hauling machinery and trucks are surfaced with course road based gravel to minimise fines. The road base materials used are produced onsite as a low fines material or clean gravel. The resulting surface does not have soil particles incorporated in it until trucks starting spreading the fines as they move around the site. This reduces the overall dust level on the roads other than in turning areas where the road surface is disturbed and the stockpile area associated with fines for production of road based gravel blends.

Wheel dust from incoming trucks also creates issues on the site as the trucks presently travel over gravel roads to the quarry. This dust tends to drop when the trucks stop and therefore concentrate around the weighbridge where the trucks weigh in and out. The area is targeted by the water truck and also capped with course gravel on occasions to cover the fine clays present in this wheel dust.

The pug-mill includes a stockpile area for fines and products such a lime to blend into the required road base material. The stockpiles of fines are confined when possible but watering of these fines is not possible. Management options for this site are limited to confinement and controlled loading activity.

The following table 24 presents estimated water consumption data for the existing dust suppression plan currently being undertaken at the quarry.

Table 24: Water balance for average rainfall year – Current operation

Source	Flow rate	Daily Use	Volume (ML/Y)	Calculation methodology

	L/s	KL		
Secondary crusher and sieve (dust sprays)	1.5	43	10.8	Based on present use for a 5-day operating week for 50-weeks per year
Dust suppression on internal roads		27	6.75	Based on application of 5mm for 300m of road for 3 times per day (average)
Total water applied			17.55	
Average annual Runoff into sediment pond system			55	Average rainfall on catchment determined by USDA model
Additional available water after average daily use			37.45	Runoff from disturbed catchments less total water out

Table 25 presents the estimated annual water use once the operation on the site is extended to include an average of 6-days per week to crush and despatch 225,000 to 300,000 tonnes of product from the site.

Table 25: Water balance for average rainfall year – Proposed operation

Source	Flow rate L/s	Daily Use KL	Volume (ML/Y)	Calculation methodology
Secondary crusher and sieve (dust sprays)	1.5	65	20	Based on present use for a - day average operating week for 52-weeks per year
Dust suppression on internal roads		36	11	Based on application of 5mm for 300m of road for 4 times per day (average)
Total water applied			31	Water used for dust suppression
Average annual Runoff from into sediment pond system			55	Average rainfall on catchment determined by USDA model
Additional available water after average daily use			24	Runoff from disturbed catchments less total water used

The crushing equipment will operate for longer periods to produce more gravel from the site. Water use for the misting sprays will therefore almost double if dust is to be suppressed on the site.

Additional water will be necessary for road watering. The increase as indicated in the previous section would not involve any significant changes to daily truck trips, however the trucks would be larger and therefore potentially produce more dust. On this basis, the roads will require more regular watering to suppress potential dust emissions from road dust.
Table 25 indicates an excess of water under average conditions for the increased production. This would mean that the storages would have a carry over capacity to provide additional water for the following years. However, this is applicable during average and above average rainfall years.
During below average rainfall years, water management may become critical to the continued operation of an appropriate dust suppression program. During such years, two options are available. Option 1 would be to utilise the water available in the southern gully area. This would produce a minimum of 7 ML. Option 2 could be implemented under emergency conditions and would involve use of the onsite bore water as a temporary back up source of water. The bore has a limited extraction rate in the order of some 2 L/s or 72 KL per 10-hour

day or approximately 4-days of average water use. The bore can be used for suppression of dust at the quarry in order to minimise dust impacts at the residence. Under worst case conditions, water could be purchased and imported to the site to continue production.

Under extreme circumstances where no water is available for dust suppression, operation of trucks hauling to and from the site in addition to operation of the secondary crushing and sieving plant will be restricted. The restrictions would be based on dust emissions at the boundary of the property. Potential recipients of dust are to the west of the site and therefore under easterly winds (NE, E, and SE), operations would be severely reduced if dust generated on the site was observed to reach the boundary of the property. Such conditions are typically noted in the morning periods or periods immediately prior to a rainfall event. Under southerly and westerly based winds (S, SW, W, NW) dust emmissions from truck and sieving activity would generally be carried back into the quarry area. Under all operational circumstances where water is limited, production rates would need to be reduce in order for management to meet their environmental responsibilities.

The main parameter controlling activity on the site under conditions where water is limited is the distance of dust movement from the site. Where general oberservations of dust travel indicate that qualitative observations are insufficient, monitoring of PM10 and PM2.5 would be undertaken at a downwind position to quantify emissions.

Road watering is an essential part of the dust suppression program. The increase in production may result in further dispersement of truck trips to and from the site. On this basis, roads would have longer periods between truck movements to dry out. Planning of road watering will therefore need to include truck arrival and departure factors. This would include an initial road watering prior to arrival of trucks, road watering during any periods where truck traffic becomes congested on the site and road watering under windy conditions where wind borne dust is generated.

The proposed operating hours include the option to operate on a 24-hour basis under exception circumstances to produce and deliver road base materials and gravel to local and state authorities for road reconstruction or emergency work. Such work is generally associated with an extreme rainfall event or flood event that has caused road damage and other infrastructure damage. The rainfall event that has triggered such circumstances would cause two conditions to occur at the quarry site. Firstly, the rainfall event would fill all storages and therefore excess water would be available for the dust suppression program. Secondly, the gravel material to be processed on the site would retain a high moisture content and the road surfaces within the quarry would generally be wet or have substantial moisture present. The processing of wet gravel would require only limited use of the dust suppression misting system during the secondary crushing and the sieving process in order to limit the moisture content of the road base material to the specification established for delivery of these materials. (10-20% moisture) The haul roads within the pit would retain a high subgrade moisture level and therefore only require light surface watering to minimise dust generated by truck movements within the quarry area. Under such emergency circumstances, major reconstruction of roads would be delayed until conditions where suitable machinery became available to the road authorities. If such delays occurred, the water storage capacity at Runnymede is considered as more than sufficient to undertake a full dust suppression program if the quarry material and roads become dry.

Dust suppression forms part of the Environmental Management Plan (EMP) for Runnymede Quarry. The EMP includes management tools identified as part of normal daily operations that will ensure that the quarry complies with dust emission criteria in accordance with the

POEO Act, in particular sections 124 and 127. A copy of the current EMP is presented in appendix 6.

15.5 Hydrocarbon Storage

Diesel fuel at Runnymede is stored in an existing facility comprising three steel tanks located within two concrete bunds. This facility provides fuel for both farming and the quarrying operations.

Any escape of diesel fuel from this facility would flow into a sediment pond and would not cross the boundary of the subject land. It is proposed that an additional bund 600mm high be constructed around the facility and the steel supports for two tanks be encased in concrete to bring the facility into compliance with AS 1940. Upgrading the fuel storage facility in this way would mitigate any potential risk of contamination from a hydrocarbon spill.

15.6 Explosive accident

No explosives are stored on site. All blasting on site is conducted by licensed contractors who design the blast and bring the explosives to the site, load the shot holes and fire the blast. The use of experienced licensed shot firers reduces the likelihood of a potential explosive accident while the remote location of the quarry reduces the risk of injury to the public and damage to property from any mishap.

15.7 Machinery accident

Machinery used on site includes excavators, loaders, dump trucks, crushers, screens, conveyors and a pug mill. Road trucks are used for deliveries both to and from the quarry. The quarry is located on private land and the public are excluded from all work areas. A mine safety management plan, which includes specific occupational health and safety measures has been adopted and is in force. The mine safety management plan sets out operating procedures for the quarry and the individual items of machinery. All workers have received induction and necessary training and where licences are required to be held for plant operation those licences are in place.

The mine safety management plan is kept under continuous review and is updated as necessary. It is expected that the plan would be reviewed in relation to the increased output being sought in this application.

15.8 Biodiversity

Section 5A of the Environmental Planning and Assessment Act 1979 sets out, for the purposes of the Act, matters that must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations, ecological communities, or their habitats.

The following investigation and the Seven Part Assessment address the environmental assessment required by section 5A of the Environmental Planning and Assessment Act 1979.

15.8.1 Threatened species, populations and habitats

Flora

The area into which the quarry is progressing has in the past been cleared and cultivated for cropping. It is now used for light grazing. Some regrowth of timber (mostly Acacia and Cypress) and extensive weed growth was noted. The remainder of Runnymede is a mixture of wooded and cleared areas. The wooded areas on the property have previously been logged and comprise scattered Ironbark as an upper canopy with dense Cypress forming a closed mid storey which excludes sunlight. Groundcover is sparse to non-existent in wooded areas due to the closed nature of the mid storey. A search of the NSW wildlife atlas over a 10 kilometres square area centred on the quarry revealed that no threatened flora have been recorded in the search area. The following Table lists the flora observed during site visits.

Table 26: Flora observed on Runnymede

Common name	Scientific Name	Notes
Narrow Leaved Red Cotton Bush	*Gomphocarpus fruticosus*	A weed that is toxic to stock but is rarely eaten.
Prickly Pear	*Opuntia stricta*	A declared noxious weed in NSW.
Tiger Pear	*Opuntia aurantiaca*	A declared noxious weed in NSW.
Balloon Cotton Bush	*Asclepias physocarpa*	A weed that is toxic to stock but is rarely eaten.
Noogoora Burr	*Xanthium spp*	A declared noxious weed in NSW.
Paspalum	*Paspalum dilatatum*	On open grazing areas.
Couch	*Cynodon dactylon*	Planted on batters and sediment ponds for stabilisation
Wiry Panic	*Entolasia stricta*	Along roadsides on red sandy soil.
Pitted Bluegrass	*Bothriochloa decipiens*	On open grazing areas.
Wire Grass	*Aristida spp*	On open grazing areas and on red sandy soil.
Coolatai Grass	*Hyparrhenia hirta*	Along roadsides and on disturbed red sandy soils under young pioneer Wattle.
Myall	*Acacia pendula*	Four trees with some juvenile regrowth. These trees are outside the proposed quarry footprint.
Wattle	*Acacia leiocalyx*	Pioneer species on disturbed areas, also invading open grazing areas.
Wattle	*Acacia deanei*	As above.
White Cypress	*Callitris glaucophylla*	Dominant regrowth on logged areas.
Ironbark	*Eucalyptus creba*	Young trees interspersed throughout White Cypress regrowth.
Wilga	*Geijera parviflora*	Occasional regrowth on the edge of disturbed areas and grazing areas.
Budda	*Eromophila mitchellii*	As above.
Kurrajong	*Brachychiton populneus*	Single tree in area containing Myall.
Krui tree (emu apple)	*Owenia acidula*	Regrowth from previous clearing. Several clumps present

The main quarry area supports a relatively sparse growth of grass and trees that have regrown since the clearing had been undertaken for the original cultivation of the paddock. The areas to the north and south of the cultivation paddock remain in a relatively undisturbed woodland state that is presently grazed. The lower sandier areas had also been subject to clearing and now support a relatively dense lower storey of acacia and cypress regrowth. This regrowth has been retained for the purpose of providing a vegetative buffer between the working area and the less disturbed woodland that has been retained on Runnymede.

The adjoining Bullala National Park contains several different habitat areas and a broader range of flora. The detailed flora survey of the Park area provided an extensive list of species both common and rare to the region. The Park had been subjected to logging when it was a State Forest. The logging process included construction of several haul roads, but did not include broad scale clearing for agriculture. The Park remains relatively undisturbed as there are minimal park visitors and the area is generally not used by stray stock.

15.8.2 Vegetation clearing

The development site has been previously cleared and cultivated and is presently used for light grazing by horses and cattle. The only vegetation clearing would involve clearing of a previously cleared area. This is considered as permissible. The relatively undisturbed woodland around the quarry areas would remain in its present form. The area would remain undisturbed by machinery and therefore have a relatively natural path for self-remediation.

15.8.3 Fauna

A search of the NSW wildlife atlas revealed that habitat for the following threatened fauna species is recorded in a 10 square kilometre area centred on the quarry:

Table 27 Threatened fauna species that may have habitat within the locality

Common name	Scientific name	Legal status
Speckled Warbler	*Pyrrholaemus saggitatus*	Vulnerable
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Vulnerable
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	Vulnerable
Little Lorikeet	*Glossopsitta pusilla*	Vulnerable
Turquoise Parrot	*Neophema pulchella*	Vulnerable
Masked Owl	*Tyto novaehollandiae*	Vulnerable
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable
Black-striped Wallaby	*Macropus dorsalis*	Endangered
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable
Little Pied Bat	*Chalinolobus picatus*	Vulnerable

A search of the Threatened Species database revealed a number of additional fauna species that, although they have not been recorded in the search area, are believed to be present in the wider Northern Basalts sub region. These additional species have been included in the following table.

Table 28: Fauna from the Threatened Species database

Common Name	Comment	Observed	Included in 7 Part Test
Speckled Warbler	No habitat present to support this species	N	N
Glossy Black-Cockatoo	No habitat present to support this species	N	N
Grey-crowned Babbler (eastern subspecies)	Habitat not present but may forage	N	Y
Little Lorikeet	No habitat present to support this species	N	N
Turquoise Parrot	Potential habitat adjoins, may forage	N	Y
Masked Owl	Habitat not present but may forage	N	Y
Yellow-bellied Sheathtail-bat	Potential habitat adjoins, may forage	N	Y
Black-striped Wallaby	No habitat present to support this species	N	N
Squirrel Glider	No habitat present to support this species	N	N
Koala	No habitat present to support this species	N	N
Little Pied Bat	Potential habitat adjoins, may forage	N	Y
Squatter Pigeon	No habitat present to support this species	N	N
Painted Honeyeater	No habitat present to support this species	N	N
Little Eagle	Potential habitat adjoins, may forage	N	Y
Square-tailed Kite	Potential habitat adjoins, may forage	N	Y
Hooded Robin (SE Form)	No habitat present to support this species	N	N
Eastern Bentwing-bat	No roosting habitat present, may forage	N	Y
Bristle-faced free-tailed bat	Potential habitat adjoins, may forage	N	Y
Barking Owl	Potential habitat adjoins, may forage	N	Y
Zigzag Velvet Gecko	May be present in adjoining woodland	N	Y

Common Name	Comment	Observed	Included in 7 Part Test
Border Thick-tailed Gecko	No habitat present to support this species	N	N

The above table considers whether identified species are to be included in the Seven Part Test. Criteria used for this determination is whether suitable habitat is available on existing disturbed areas or areas to be disturbed during the life of the quarry and/or whether a species may forage on the quarry site from adjoining areas.

The following presents an overview of the species to be considered in the 7-Part test, their habitat requirements and threats.

Listed Fauna Review

Pomatostomus temporalis temporalis
(Grey-crowned Babbler (eastern subspecies)) Vulnerable

Habitat requirements
The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. West of here the subspecies *rubeculus*, formerly considered a separate species (Red-breasted Babbler) is still widespread and common. The eastern subspecies (*temporalis* occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occur on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.

Grey Crowned Babblers find flight laborious and prefer to hop to the top of a tree and glide down to the next one. They are generally unable to cross large open areas.

Grey Crowned Babblers live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. All members of the family group remain close to each other when foraging. A soft 'chuck' or 'tuk' call is made by all birds as a way of keeping in contact with other group members. Grey Crowned Babblers feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses. They build and maintain several conspicuous, dome-shaped stick nests about the size of a football. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones.

Grey Crowned Babblers breed between July and February and usually lay two to three eggs which are incubated by the female. During incubation, the adult male and several helpers in the group may feed the female as she sits on the nest. Young birds are fed by all other members of the group. Territories range from one to fifty hectares (usually around ten hectares) and are defended all year. Territorial disputes with neighbouring groups are frequent and may last up to several hours, with much calling, chasing and occasional fighting.

Threats

- Clearing of woodland remnants.
- Heavy grazing and removal of course, woody debris within woodland remnants.

- Nest predation by species such as Pied Currawongs, Ravens and Butcherbirds may be an issue in some regions where populations are small and fragmented.

The species may occur in surrounding woodland that is less disturbed by regular activity associated with the quarry. The quarry has been operating since 1995 and therefore this species should have adapted the presence of the quarry. As there is no additional undisturbed habitat to the cleared, the proposal should not impact this species.

Neophema pulchella
(Turquoise Parrot) Vulnerable
Habitat requirements
The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. They live on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Turquoise Parrots are usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Turquoise Parrots prefer to feed in the shade of a tree and spend most of the day on the ground searching for seed, grasses and herbaceous plants, or browsing on vegetable matter. They forage quietly and may be quite tolerant of disturbance; however, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Turquoise Parrots nests in tree hollows, logs or posts, with breeding from August to December. They lay four or five white, rounded eggs on a nest of decayed wood dust.

Threats

- Clearing of grassy-woodland and open forest habitat.
- Loss of hollow-bearing trees.
- Degradation of habitat through heavy grazing, firewood collection and establishment of exotic pastures.
- Predation by foxes and cats.
- Illegal trapping of birds and collection of eggs which also often results in the destruction of hollows

The species would on occasion be present in the woodland surrounding the quarry area; however it may also forage along the edge of the cleared area between the woodland and the proposed quarry areas. The species generally adapts to the presence of the quarry operation which would disturb the lower active area only. The higher open paddock through which the quarry is to be extended over the next 30-years or more would have little disturbance and therefore the species could if present, graze on the grass seeds present in this paddock.

Tyto novaehollandiae
(Masked Owl) Vulnerable
Habitat requirements
The Masked Owl's distribution extends from the coast where it is most abundant to the western plains. Overall sighting records for this species include approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. The Masked Owl is found in dry eucalypt forests and woodlands from sea level to 1100m. Usually a forest owl, but often hunts along the edges of forests, including roadsides. The Masked Owl's typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs of Masked Owls have a large home-range of 500 to 1000 hectares. The Masked Owl roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Threats

- Loss of mature hollow-bearing trees and changes to forest and woodland structure, which leads to fewer such trees in the future.
- Clearing of habitat for grazing, agriculture, forestry or other development.
- A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides.
- Being hit by vehicles.

The proposed development would not result in any additional loss of habitat for this species. The retention of the open area around the quarry operation may provide additional foraging habitat if this species is present.

Saccolaimus flaviventris
Yellow-bellied Sheathtail-bat (Vulnerable)
Habitat requirements
The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. The Yellow-Bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, bats fly high and fast over the forest canopy, but lower in more open country. They forage in most habitats across its very wide range, with and without trees; and they appear to defend an aerial territory. Breeding of Yellow-bellied Sheath-tailed Bats has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.

Threats

- Disturbance to roosting and summer breeding sites.
- Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.
- Loss of hollow-bearing trees; clearing and fragmentation of forest and woodland habitat.
- Pesticides and herbicides may reduce the availability of insects, or result in the accumulation of toxic residues in individuals' fat stores.

No additional habitat loss will occur as result of clearing of undisturbed areas.

Chalinolobus picatus
Little Pied Bat (Vulnerable)
Habitat requirements
The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. The Little Pied Bat occurs in dry open forest, open woodland, mulga woodlands, chenopod shrub lands, cypress-pine forest, mallee, bimble box woodland. They roost in caves, rocky outcrops, mine shafts, tunnels, tree hollows and buildings and can tolerate high temperatures and dryness but need access to nearby open water. Little Pied Bats feed on moths and possibly other flying invertebrates.

Threats

- Loss or modification of habitat.

- Predation by cats.
- Application of pesticides in or adjacent to foraging areas.

The presence of the ponds and dams created as part of the quarry provides the open water surface that this species needs. These ponds will remain as a permanent fixture of the development and the rehabilitation works. Without these ponds the species would not be present other than during wet periods when small natural ponds remained in the surrounding creeks.

Hieraaetus morphnoides
Little Eagle (Vulnerable)
Habitat requirements
The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. The Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. The Little Eagle nests in tall living trees, where pairs build a large stick nest in winter. They lay two or three eggs during spring, and young fledge in early summer. The Little Eagle preys on birds, reptiles and mammals, occasionally adding large insects and carrion.

Threats

- Clearing and degradation of foraging and breeding habitat.
- Urban expansion.
- Rural-residential subdivision and associated land uses (e.g. horse and goat grazing).
- Secondary poisoning from rabbit baiting.

The continued quarry operation will not clear any additional habitat that may be utilised by this species.

Lophoictinia isura
Square-tailed Kite (Vulnerable)
Habitat requirements
The Square-tailed Kite ranges along coastal and sub-coastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Square-tailed Kites are found in a variety of timbered habitats including dry woodlands and open forests and shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. The Square-tailed Kite is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. The Square-tailed Kite occupies large hunting ranges of more than 100km^2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March.

Threats

- Clearing, logging, burning, and grazing of habitats resulting in a reduction in nesting and feeding resources.
- Disturbance to or removal of potential nest trees near watercourses.
- Illegal egg collection and shooting.

No additional habitat disturbance is to be undertaken as part of the development.

Miniopterus schreibersii oceanensis
Eastern Bent-wing bat (Vulnerable)
Habitat requirements
Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Bent wing Bats form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. The Bent wing Bat hunts in forested areas, catching moths and other flying insects above the tree tops.

Threats
- Damage to or disturbance of roosting caves, particularly during winter or breeding.
- Loss of foraging habitat.
- Application of pesticides in or adjacent to foraging areas.
- Predation by feral cats and foxes.

The species if present may continue to utilise the habitat available at the quarry site.

Mormopterus eleryi
Bristle-faced free-tailed bat; Hairy-nosed Freetail Bat (Endangered)
Habitat requirements
The Hairy-nosed Freetail Bat is a small insectivorous bat distributed from the southern half of the Northern Territory to central Queensland and north-western NSW. In NSW, the species has been recently recorded from only three disjunct locations: thirteen individuals from Gundabooka National Park, south of Bourke; one individual from Dhinnia Dthinawan Nature Reserve (formerly Bebo State Forest), north of Warialda two individuals near Bonshaw. The Hairy-nosed Freetail Bat appears to be extremely rare throughout its range. Nationally, it has been recorded from only 15 locations. Knowledge of the ecology of the Hairy-nosed Freetail Bat is limited; however evidence suggests that the species depends on hollows and tree fissures for roosting sites. All other Australian species from the same family generally roost in tree hollows and fissures.

Threats
- Clearing and removal of hollow bearing trees as a consequence of firewood collection and agricultural and forestry practices.

The threat to the Hairy-nosed Freetail Bat from loss of habitat is exacerbated by its apparent low population numbers. The proposed development does not include the removal of any nesting habitat for this species.

Ninox connivens
Barking Owl (Vulnerable)
Habitat requirements
The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains (especially the Pilliga) and in some northeast coastal and escarpment forests. Many populations of the Barking Owl have declined rapidly as woodlands on fertile soils were cleared, leaving linear riparian strips of remnant trees as the last habitable areas.

The Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. The Barking Owl is flexible in its habitat use and hunting can extend in to closed forest and more open areas such a cropping areas. Barking Owls are sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. They roost in shaded portions of tree canopies, including tall mid-storey trees with dense foliage such as *Acacia* and *Casuarina* species. During the nesting season, the male Barking Owl perches in a nearby tree overlooking the hollow entrance.

The Barking Owl preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations it becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Barking Owls can catch bats and moths on the wing, but typically hunts by sallying from a tall perch. They require very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.

Breeding usually occurs from July to November when two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas).The female Braking Owl incubates the eggs for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging starts 2 weeks later. The young are dependent on the parents for several months.

Threats

- Clearing and degradation of habitat, mostly through cultivation, intense grazing and the establishment of exotic pastures.
- Inappropriate forest harvesting practices that remove old, hollow-bearing trees and change open forest structure to dense regrowth.
- Firewood harvesting resulting in the removal of fallen logs and felling of large dead trees.
- Too-frequent fire leading to degradation of understorey vegetation which provides shelter and foraging substrates for prey species.

No nesting habitat is to be cleared as part of the continuing quarry operation. The disturbed areas will support some food species for this Owl.

Oedura rhombifer
Zigzag Velvet Gecko (Endangered)
Habitat requirements
The Zigzag Velvet Gecko is known in NSW from three single specimens. One from Bebo State Forest, another from north of Warialda near the NSW-Queensland border, and a third individual recorded in Arakoola Nature Reserve, 50km south of Bebo. They are largely confined to woodland habitats; however they have also been recorded from rubbish dumps and buildings. The Zigzag Velvet Gecko is considered to be arboreal, living and foraging in trees. Both NSW specimens were found beneath the decorticating bark of standing trees. They feed on small insects.

Threats

- Habitat loss and degradation.
- Alteration to natural fire regimes which removes leaf litter and fallen timber that provides habitat and shelter.

- The NSW population may be comprised of several isolated populations and may be subject threats associated with the loss of genetic variability.
- Predation by foxes and cats.

Little is known about the preferred habitat of this species. The quarry operation will extend into disturbed habitat and the uncleared area surrounding the quarry would be retained. As the quarry moves at a very slow rate, the open cleared area across the top of the ridge would remain open for migration of this species through Runnymede.

Appendix 9 presents a 7-Parameter test in accordance with legislative requirements. The test has concluded that the ongoing development of the quarry does not represent a significant threat to threatened species, populations or communities that are present in the surrounding area.

15.8.4 Edge effects and impacts on Bullala National Park

Prior to 2005 Bullala National Park was the Bullala State Forest and was logged to provide timber resources for the sawmill and building industry. In 2005 the Bullala State Forest was dedicated as a national park, however, as yet no visitor amenities such as access roads, tracks, picnic or toilet facilities have been installed to attract the public.

Runnymede quarry, Gil Gil Creek Road and the access road from Gil Gil Creek road to the Runnymede property all pre-date the dedication of the national park. The quarry is set back around one kilometre from the nearest boundary with Bullala National Park. The buffer area consists of similar woodland to that contained within the park area.

The 'edge effect' is a term used to describe the various effects generated when one type of land use or vegetation type shares a common border with a different land use or vegetation type. The 'edge' between Runnymede and the Bullala National Park comprises the common boundary between the two land holdings. This boundary is fenced and on the Runnymede side of the fence, cleared to a distance of around six metres. This boundary fence will help to prevent unauthorised access to the national park, prevent the establishment of informal tracks and limit access to domestic animals entering the park.

Another 'edge' is the interface between Gil Gil Creek Road and the national park. Again, the road pre-dates the park and the only change in edge effects would be related to dust generated by an increase in traffic moving on this road and impinging on leaf surfaces and altering the rate of photosynthesis, gas exchange and temperature.

In the publication *Edges – their effect on vegetation and wildlife* (State of Victoria – Natural Resources and Environment 2002) the question of how edge effects vary with shape and size is examined. More angular areas with narrow shapes, such as the south-western portion of Bullala National Park, provide little if any protection against edge effects. This is largely due to this narrow section of park having farming operations on either side and being bisected by a gravel road which provides access to the quarry as well as a number of farming properties and the Crooble grain silos.

Donald Doley, writing in Clean Air and Environmental Quality Vol 40, No.2, May 2006 (PP 36-43) states that vegetation acts to remove dust particles from the air by sedimentation and impaction and may enhance air quality in urban areas, near roadways and in agricultural situations. He claims that rates of dust deposition to an ecosystem may be approximated by the rate of deposition to a static collector and that the direct physical effects of mineral dust on vegetation become apparent only at high surface loads i.e. greater than 7 grams per square metre.

Results of dust monitoring undertaken for this project during 2009/2010 show an average deposition in grams (total solids) per square metre per month of 4.2 for the quarry and 4.7 for Mosquito Creek Road. The mineral dust component averaged less than 1 gram per square

metre per month for both monitoring sites suggesting that human-generated dust would have little impact on the national park. Doley states that it is difficult to estimate the rate of loss of dust from vegetation as it is influenced by wind and rain and can be in excess of 85%. The health and vigour of the vegetation growing adjacent to Gil Gil Creek and Mosquito Creek Roads also suggests that dust from transport operations on those roads has had little negative impact as regeneration has been extensive after the original clearing of this road was undertaken.

Doley also shows that the effectiveness of vegetation in intercepting airborne dust is related to the size of the vegetation elements and aerodynamic porosity. The following photograph shows the vegetation at the intersection of the quarry access road with Gil Gil Creek Road in the Bullala National Park. Small vegetation elements are more effective in removing small particles and low aerodynamic porosity combined with high leaf area density is generally the most effective. As can be seen in the photograph the vegetation would prevent road dust from penetrating more than a handful of metres from the road into the national park. Inspection along the edge of roads with vegetation similar to figure 20 identified relatively clean leaves at a distance of approximately 10m from the road verge.

More open forest areas along the road side have a ground cover of grasses. The grasses are shorter and therefore do not intercept the dust. The impact zone for dust deposition tends to more than 10m in such areas.

The proposed development includes an agreement between Council and the Proponent to upgrade the haul road to a bitumen sealed road. Once this occurs, road dust will all but be eliminated from the main haul road which includes Gil Gil creek road through Bullala National Park.

The entrance road between Gil Gil creek road and the boundary of Runnymede is constructed of course gravel to minimise dust. This road will be subjected to road watering on an as required basis. NSW National Parks have inspected this road and commented that edge effects from dust are minimal and at present have not degraded the adjoining vegetation.

Figure 20: Gil Gil Creek Road Vegetation

Operations at Runnymede quarry are centred in the western part of the property and will gradually extend through the central part of the land. The active quarry face produces minimal dust emissions and therefore would cause minimal disturbance to the surrounding woodland. The active stockpile and processing area will be subjected to road watering to limit dust emissions. The immediate area around the active processing site includes some dust as this is not preventable when dealing with aggregate materials. Dust deposition monitoring undertaken to the southwest of this active area had targeted the emissions from this active part of the quarry. The results of this testing indicated that the dust deposition rate at the boundary of the property was within NSW acceptable standards.

The edge effects of the quarry operation have to date been limited to the immediate surrounds of the quarry in areas that have been required for stockpiling, roads, cleared areas or other infrastructure. These areas are therefore highly disturbed, but also provide a buffer to areas outside of this disturbance. The surrounding woodlands and National Park show no immediate signs of edge effects that were considered to be significant. The proposed increase in production from the quarry will be undertaken in accordance with similar management strategies and therefore aim to limit the impact of the quarrying to the current footprint.

15.8.5 Maintain or improve biodiversity values

The development is presently approved and this application is to amend the present approvals to increase annual output only. This application does not increase the final footprint nor increase the total amount of resource to be extracted. As the development is taking place on previously cropped and cultivated land this investigation predicts that there would be no additional impact on native biodiversity values. The original development and proposed development included rehabilitation of the site which included all disturbed areas other than the sedimentation system and water storages. On this basis existing biodiversity values would be maintained.

15.9 Natural Hazards

The site is above the level of the one percent annual exceedances flood event and is geologically stable and not subject to subsidence, slip or mass movement. Council's Bushfire Hazard Map indicates that the development site is not bushfire prone, however, surrounding land, including the Bullala National Park, is bushfire prone. Adequate fire breaks are maintained on Runnymede to protect from fire escaping from the national park. Furthermore, Runnymede is grazed which reduces bushfire risk by controlling fuel loads.

15.9.1 Quarry Closure and Rehabilitation

The quarry rehabilitation would commence immediately following the cessation of extraction which could occur in 2040-2045. The following provides and outline of the proposed rehabilitation methods that would be used to return the land to agricultural use.

15.9.2 Contamination assessment

A preliminary investigation in accordance with the requirements of State Environmental Planning Policy No. 55 would be undertaken to determine whether there was contamination present and if so, whether remediation was required. The remediation would be undertaken where necessary, prior to rehabilitation.

15.9.3 Infrastructure

Crushing and screening plant including conveyors, silos, mills and weighbridge etc. would be dismantled and removed from the site for use at other company facilities. The workshop would remain as a machinery shed to compliment the agricultural use of the land.

15.9.4 Stockpile areas

The stockpile areas consist of a gravel hardstand. Stockpiled gravel would be removed and the foundation would be ripped, contoured, planted to grass and fertilised. It is estimated that the clean-up of stockpiled areas to remove the base course on this site could yield up to 79,200 cubic metres of gravel which could be sold to offset the cost of rehabilitation, or used to contour the floor of the void prior to spreading topsoil.

15.9.5 High Walls

The high walls would remain as would the cut off drains and banks around the rim of the void. Some scaling down of the high walls may be required to remove weathered rock. Excess material in the form of crusher dust may be utilised along the vertical batters to reduce the present slope. A four strand permanent rural fence would be erected to exclude cattle from the northern, eastern and southern faces of the void.

15.9.6 Over burden and topsoil

Overburden and then topsoil would be recovered from the overburden and topsoil stockpiles and placed on the floor of the void and the hardstand areas, contoured to ensure proper drainage and then fertilised and sown to grass.

Existing sediment ponds would remain in place.

15.9.7 Estimated costs

Estimated rehabilitation costs and a rehabilitation budget have been calculated based on today's figures. These figures should be reviewed over the life of the project to ensure that adequate funds are available to complete the rehabilitation. The cost estimates are set out below.

Table 29: Estimated rehabilitation costs for Runnymede quarry

Rehabilitation Works	Cost in $	Units
Active Quarry & Voids		
Active Pit	778,699.50	
Ramps	0.00	
High Wall Treatment	37,260.00	
Disturbance Ahead of Mining	0.00	
River & Creek Diversion	0.00	
Other	0.00	
Sub Total	**815,959.50**	
Tailings		
Tailing Dams	0.00	
Other	0.00	
Sub Total	**0.00**	
Waste Rock Dumps		
Successful Rehabilitation	0.00	
Shaped Waste Rock Dumps	0.00	
Unshaped Dumps (minor)	0.00	
Unshaped Dumps (major)	0.00	
Other	0.00	
Sub Total	**0.00**	
Total	**815,959.50**	
GST 10%	**81,595.95**	
Total incl. GST	**897,555.45**	
Estimated Volume of Material Removed*	**3,000,000**	**m3**
***One m^3 of solid basalt weighs 3011 kg**	**9,033,000**	**tonnes**
Budgeted Rehabilitation Cost	**0.30**	**/m3**
	0.10	**/tonne**

The party responsible the rehabilitation of the quarry and associated disturbed areas is Johnstone Concrete and Quarries Pty Ltd.

15.10 Soil and Water

15.10.1 Soil and Water Management Plan

Runnymede Quarry has been operating for some seventeen years and has effectively managed the storage, detention and treatment of water on the development site. Evidence in support of this is the fact that since operations began there has only been one discharge of water to the environment from a sediment basin and the quality of the discharged water met the requirements for water release as set out in Environment Protection Licence 7379. This discharge occurred in November 2011 following heavy rain over several days. This regional

rainfall event resulted in extensive flooding that isolated many downstream towns and villages and was therefore considered as a major storm event.

A Soil and Water Management Plan (SWMP) is presented in appendix 7 of this report. The SWMP incorporates the detail that is required within both a Water Management Plan, and an Erosion and Sediment Control Plan.

Based on the information presented in appendix 7 in relation to the proposed increase in annual production from Runnymede Quarry, and with the implementation of the recommended mitigation and control measures relating to soil and water management at the development site, it is anticipated that there would be minimal impact on surface water within and downstream of the development site as a result of the proposed operations. The key features of the proposed water management system are as follows.

- All clean water would be diverted around the site, minimising the amount of dirty water to be captured and treated.
- All runoff from the site would pass through the existing retention basins.
- If excess water is present in the sediment basins this water should be used to over water road areas on the site to ensure that the sediment basins retain sufficient capacity to function as designed.
- These basins should remain in place and serve as a 'backup' following rehabilitation of the site should there be an extreme rainfall event.

15.11 Noise

The NSW Industrial Noise Policy (INP) requires industrial noise to be within acceptable levels to maintain the amenity of receptors. Runnymede quarry is located in a rural area and therefore the INP describes residences within this area as *Rural*. The noise criteria for emissions from the quarry therefore must be limited to ensure that the amenity of existing rural residences in the local area is not reduced. The area does not include any other industrial sources of noise and therefore there is no cumulative impact to be assessed.

15.11.1 Construction

No construction is proposed therefore construction noise is not considered in this report.

15.11.2 Site description

The quarry is located on the property "Runnymede" approximately 17 kilometres northeast of the village of Pallamallawa. The topography is undulating and the surrounding area comprises farming properties. The Bullala National park adjoins to the north and west. A residence is situated on Runnymede. It is located adjacent to the lower stockpile and workshop area. The nearest residence not associated with the quarry is approximately 3.1 kilometres to the west-north-west. This consists of a rural homestead located on the western side of Bullala creek.

The quarrying operation produces several sources of noise, mainly the active extraction of rock within the quarry area, the crushing and sieving of rock at the screening plant and noise generated by trucks entering and exiting the site. The extraction and processing of materials on the site occurs as a stationary noise. The movement of trucks is considered a mobile noise. Additional noise is generated during blasting and drilling to extend the quarry face. Blasting is monitored for noise and vibration. Blasting is undertaken after 9am and before 4pm. The noise generated from blasting has not been heard by the closest residence. Drilling is undertaken by relatively small mobile equipment prior to blasting. The noise is generated from this activity is audible within the quarry area but not audible at the weighbridge area within the quarry boundaries.

The primary crushing operation is undertaken by one or two mobile jaw crushers. The crushers are moved to the work face and then remain at this point until sufficient rock is crushed to supply the weekly volume of gravel material. The crushers are therefore located some 10m-15m below ground level in the quarry and surrounded on all sides by the quarry walls and internal stockpiles. Access to and from the primary crusher is formed by an opening in the quarry wall on the western end.

Crushed rock is transported from the primary stockpiles to the secondary crusher and screening plant by front end loader and dump truck. The secondary crusher is used to reduce the size of the rock and screened to provide the finished grades of material. The secondary crusher and screens are located directly to the west of the entrance to the quarry. The major stockpiles of screened gravel product are on the western side of the screening plant. The material is stockpiled in this location to form an acoustic barrier to a height of up to 8m, thus causing deflection of noise produced by the secondary crushing and screening plant.
The lower stockpiles, workshop, weighbridge and residence are located at a lower level on the flatter terrain associated with the western toe of the ridge that is being quarried. Noise generated in this area is generally from mobile plant or small operations undertaken at or close to ground level. Truck manoeuvring occurs in this area. This includes revving under load to climb upslope to the main stockpile areas.

15.11.3 Noise Assessment

Noise sensitive receptors

The closest noise sensitive receptors to Runnymede quarry consist of rural homesteads. "Kirkton" homestead is located approximately 3,100 metres west-north-west and "Sheba Downs" is located approximately 3,800 metres north-north-east from the secondary crushers on Runnymede quarry. The closest urban area (Pallamallawa) is located approximately 17 kilometres from the quarry.

The residence on the quarry site is utilised by the applicants as a residence and therefore is not considered as a sensitive receptor. However, it is considered as a control point for management to observe noise emissions from the site.

The existing noise environment on "Kirkton" without the quarry operating is influenced by machinery used in agriculture, weather, animals (including humans) and general background noise (birds, insects, air-conditioners, wind in vegetation). Being in a rural environment, noise levels can decrease to as low as 25 dB(A) at times where background noise is low. The isolated rural residence is considered to be very sensitive to noise but tolerant of noise associated with farm activity such as trucks, tractors, running motors during both day and night periods.

Calculation of Project Specific Noise Level

The INP assessment procedure provides details of the method to be adopted to determine the noise criteria for a site. The assessment procedure has two criteria designed to ensure developments and industry meet environmental noise objectives, mainly:

- That the noise source not be 'intrusive' and,
- That the 'amenity' of the nearby land be preserved

By applying these two criteria and adopting the most stringent (lowest) level, the project specific noise level can be determined. The project specific noise level is the noise level that ensures that both intrusive noises are limited and that the amenity of nearby land is not disturbed. These criteria are adopted in this case where there are no specific noise limits set

by Development consent conditions or an Environment Protection Licence. The project specific noise level is calculated for three periods as indicated in the following table.

Table 30: NSW INP Time Periods

Period	Monday to Saturday	Sunday/Public Holidays
Day	7am – 6pm	8am – 6pm
Evening	6pm – 10pm	
Night	10pm – 7am	10pm – 8am

Continuous unattended noise monitoring was undertaken over seven days at "Kirkton" homestead which is located 3.1 kilometres west-north-west of the quarry and is the nearest sensitive receiver.

Minimal if any identifiable quarry noise was present at this residence. This was indicated by the property owner and the predecessor who lived in the house for an extended period. Due to the separation distance between the quarry and "Kirkton", the result of this monitoring was used to set the Rating Background Level (RBL) to develop project specific noise levels in accordance with section 3 of the INP. These are presented in the following table.

Noise data affected by adverse weather conditions was excluded from calculations.

Table 31: Rating background and project specific noise levels at "Kirkton"

Period	Amenity Criteria	Existing RBL $L_{A90\ 15\ min}$	Intrusive Criteria RBL plus 5 dB(A) $L_{Aeq\ 15\ min}$
Day	50	38	43
Evening	45	37	42
Night	40	34	39

Note: All values in dB(A)

The most stringent condition presented in the above calculation is the intrusive Criteria. On this basis the noise level criteria for the quarry emissions at "Kirkton" are:

- Day: 43 dB(A)
- Evening: 42 dB(A)
- Night: 39 dB(A)

These noise levels from attended and unattended monitoring revealed relatively higher levels than expected for an isolated rural residence. The results were potentially influenced by activity at the house including air conditioners, compressors in the workshop, intense bird noise surrounding the house and other abnormal noise due to the presence of the monitoring equipment.

Following discussions with OEH (now EPA), it was agreed that additional assessment was required to determine the potential impacts of noise emissions from the quarry operations. The discussions agreed that background noise in general for the area is below 30 dB(A) for all three periods of the day. It was agreed that the project specific noise level was set at 35 dB(A) by OEH in accordance with the NSW INP for all three time periods.

On this basis, SMK Consultants engaged VIPAC Engineers and Scientists to undertake an independent acoustic assessment of the quarry. VIPAC attended the site on the 13th of August, 2012. During the initial inspection of the site, VIPAC determined that noise modelling of the quarry operations would prove to be more practical in relation to noise

impact predictions and extent of the impacts. Appendix 6 presents the Acoustic Assessment of Runnymede Quarry prepared by VIPAC. The report was prepared in 2012. The same equipment used on the site at the time of the assessment remains on this site.

The noise impact assessment considered six adjoining homestead as the receptors. The acoustic modelling was based on VIPAC's attended noise monitoring during site operations and the use of the noise model "SoundPLAN". Neutral and worst case weather conditions were considered in the modelling. The criteria established for the model was based on the agreement with EPA that the project specific noise level was set at 35 $dBL_{Aeq,\ 15\text{-}minute}$ across all three time periods. Sound power levels were taken at numerous points around the quarry, including selected positions around each machine that operates on the site.

The homestead receptors of Kirkton (3.2 km west-northwest) and Waipunuka (4.34 km southwest) were within the potential impact area predicted from the modelling of noise emissions over the natural terrain around the quarry site. Under worst case conditions, the modelling predicted noise levels of 28 dB(A) and 18 dB(A) at these homesteads respectively. VIPAC's assessment therefore concluded that "The quarry operations are predicted to be within the project specific noise criteria of 35 dB_{Aeq}. The report presents two noise contour maps. These maps show noise contours under neutral and worst case conditions.

The noise modelling provides independent data to indicate that noise emissions from quarry operations are within the criteria set by EPA and within the criteria established under the NSW INP.

15.11.4 Road noise

In 2011 the then Department of Environment, Climate Change and Water introduced the NSW Road Noise Policy (RNP), this policy supersedes and replaces the Environmental Criteria for Road Traffic Noise. The roads of concern for noise impacts are generally restricted to the village of Pallamallawa which contain residences with setbacks from the property boundary of six to eight metres. Roads outside the village pass through rural land with scattered dwellings having setbacks from the road of several hundred metres.

The RNP divides public roads into three categories, freeways/motorways, sub-arterial roads and local roads. The roads through the village that serve as the transport route for the quarry also serve for the transport of agricultural commodities and would be categorised as sub-arterial roads as they serve the grain silos at Milguy and Crooble, numerous farming properties and quarries, including the subject development. Table 3 of the RNP sets out the following assessment criteria for sub-arterial roads:

Table 32 : From Table 3 of the NSW Road Noise Policy

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7a.m.-10p.m.) $L_{Aeq,\ (15\ hour)}$	Night (10p.m.-7a.m.) $L_{Aeq,\ (9\ hour)}$
Sub-arterial roads	Existing residences affected by additional traffic on existing sub-arterial roads generated by land use developments	60 (external)	55 (external)

The quarry presently contributes an average of 1.5 traffic movements per hour between 7.00 am and 5.00 pm during normal operating hours. With the increase in production this could on occasions double to an average of 3 traffic movements per hour between 7.00 am to 10 am for truck traffic as it attends the site for loading. Vehicles used to transport materials to and from the quarry comprise modern trucks maintained in roadworthy condition and registered