future-plus ENVIRONMENTAL

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current conditions of approval associated with Development Permit No. D/589-2013
Dated 11 September 2014

Our Ref: 4363

27th November 2013

Proposed Quarry Operation Expansion

Site Based Management Plan

473 Nine Mile Road, Fairy Bower, QLD

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Document Review

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Signed on behalf of
Future-Plus Environmental

Date: 22nd November 2013

Paul Wood
Director

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1.0 INTRODUCTION

1.1 PROPOSED ACTIVITY

A *Material Change of Use* is proposed at the existing Sand Extraction Quarry located at Lot 250 on R2621 (No.473) Nine Mine Road, Fairy Bower (herein referred to as 'the site'). The client proposes to expand the existing sand extraction activity from 52,000 tonnes per annum to 100,000 tonnes per annum. A Site Locality Plan has been included as Figure 1. A Proposed Site Layout Plan is provided as Figure 2.

The proposed quarry activity will be undertake in a staged process, beginning as Stage 1 in the north east portion of the site, and progressing in a southerly direction, ultimately terminating with Stage 11 in the south east corner of the site.

The site operation will consist of topsoil and overburden stockpiling area, wash and screening plant, excavation pit, sediment basins (settling pond), washed product stockpile area ready for delivery, weighbridge, car park, site office and amenities and equipment storage.

It is understood that the proposed quarry operations will undertake excavation activities for the collection, screening and washing of *fine to medium sand* products for commercial purposes. The quarry will extract, screen, wash, size and stockpile alluvial sand material, to be then sold as a commodity to customers in and around the Rockhampton area.

It is intended that the site will operate 6 days per week during the hours of 6:00am to 6:00pm on Monday to Saturday and no operations on Sunday or Public Holidays, 52 weeks per annum.

The quarry is proposed to extract a maximum of 100,000 tonne of material per year. Based on this volume the quarry is expected to dispatch no more than a maximum of thirty (30) vehicle loads daily delivering materials to surrounding areas. These collection and dispatch vehicles are likely to be truck and trailer or semi-trailer.

No fuel or oil storage will be undertaken onsite. Fuel and oil will be delivered for on-site filling of vehicles, mobile plant and equipment as required. Only minor maintenance activities will be undertaken on-site. A workshop will not be required. No truck wash bays are proposed to be associated with the development.

Based on the information supplied by the client, the proposed development will extract a maximum of 100,000 tonne per year. The volumes/quantities of quarry material being extracted and dispatched shall be recorded and monitored in accordance with the relevant legislation.

The volumes of quarry material anticipated for the site triggers the requirement for an Environmentally Relevant Activity 16(2)(b) and 16(3)(a)which is described as:

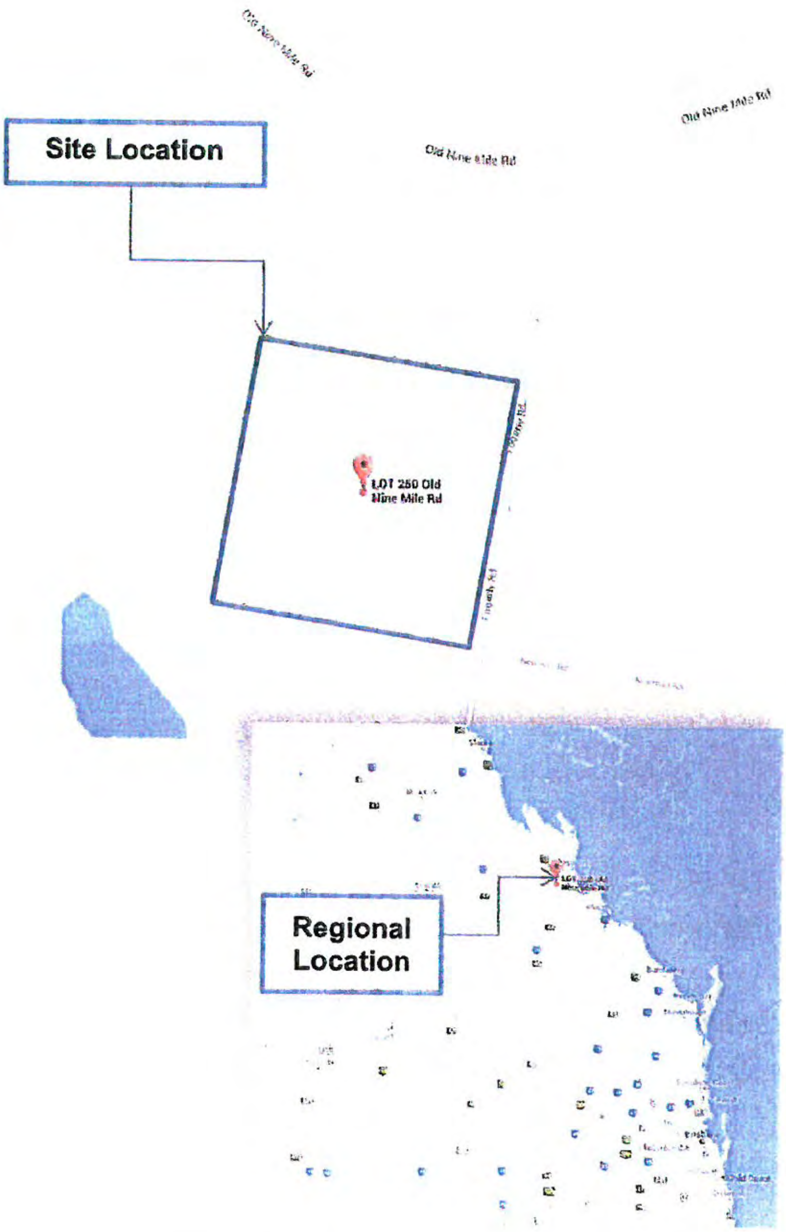
> *ERA 16(2)(b) Extracting and screening activities Extracting, other than by dredging, in a year, 5000t to 100 000t of material*

> *ERA 16(3)(a) Extracting and screening activities Screening, in a year, 5000t to 100 000t of material*

The site operates under an existing Development Permit SPCE00734910 for an ERA 16(2)(b) and 16(3)(a).

Therefore, this report has been commissioned in order to demonstrate that persons carrying out the proposed operation will have in place a suitable management plan.

Figure 1: Site Locality Plan



Source: Google Maps 2013

1.2 SITE BASED MANAGEMENT PLAN

This Site Based Management plan (SBMP) has been prepared in accordance with the Department of Environment and Heritage Protection's (DEHP) *'Guideline – Site Based Management Plans'* and *'Information Sheet – Information to be provided with an application for an environmentally relevant activity.'*

The purpose of a SBMP is to demonstrate that the client has in place a suitable management plan that satisfies their General Environmental Duty by:

- Sets the environmental objectives or standards to be achieved;
- Identifies the potential environmental harm which may occur from routine operations and establishes and documents measures to avoid this harm as far as practicable;
- Identifies extraordinary factors (i.e. abnormal operation, emergencies) that may cause environmental harm and establishes and documents contingency plans to deal with these;
- Ensures all persons carrying out the activity are aware of the environmental risks, and are trained in the measures and contingency plans to deal with them;
- Implements monitoring of environmental performance to ensure the effectiveness of the measures and contingency plans;
- Assists the communication of environmental information throughout the organisation and to the administering authority; and
- Provides for continual improvement.

1.3 GENERAL ENVIRONMENTAL DUTY

Section 319 of the *Environmental Protection Act 1994* (EP Act) sets a general environmental duty that requires persons to take all reasonable and practicable measures to prevent or minimise environmental harm from any activity that they carry out.

Under section 493 of the EP Act, if a corporation commits an offence against the Act, corporate officers (i.e. management of the company) are potentially liable for the breach.

The exceptions to this are where the corporate officer can establish that he or she has personally exercised due diligence to ensure the corporation complied, or was not in a position to influence the conduct of the corporation.

One way that management of an organisation conducting potentially environmentally damaging activities can demonstrate due diligence is by implementing an effective SBMP. It is proposed that this report is a general guide for the operator to conduct the operation in an appropriate manner.

1.4 QUARRY OPERATION DETAILS

Table 1: Proposed Quarry Operation Details

APPLICANT NAME	John Foxlee c/- ASTPD
PROPERTY DESCRIPTION	Lot 250 on R2621
REGISTERED ADDRESS	473 Nine Mile Road, Fairy Bower
AUTHORISED SIGNATORY	John Foxlee
LOCAL GOVERNMENT AREA	Rockhampton Regional Council
PROPOSED DEVELOPMENT	Quarry Operations 1) Extracting from a pit or quarry 5,000t to 100,000t of material per year. 2) Screening of 5,000t to 100,000t of material per year
SITE CONTACT	John Foxlee
TELEPHONE	0417 730 016
APPROVAL REQUIRED	MCU for expansion of existing operation under existing ERA 16(2)(b) and 16(3)(a) Development Approval SPCE00734910.

1.5 CONSTRUCTION AND OPERATION

Site development work will be undertaken on the site access road, processing areas, quarry extraction footprint and settling ponds to accommodate the increase in extraction volumes. This SBMP applies to both the development and the operational phases of the project. The extraction footprint (See Figure 2 Proposed Site Layout Plan) will be located within previously disturbed grazing lands on-site.

Rehabilitation works will be undertaken in accordance with the Site Rehabilitation Management Plan and erosion and sediment control measures will be undertaken as per the Stormwater Management Plan (completed by others).

The proposed quarry operations will involve the following:

- Scalping – Topsoil will be removed by bulldozer and front end loader and stockpiled for use in rehabilitation activities as required;
- Excavation – Alluvial sand deposits will be excavated using end loader and transferred to the processing area using dump trucks;
- Screening and washing – Unwashed sand will be loaded onto the washing plant, washed and stockpiled. Washed sand will be allowed 24 hours to drain. Wash water will be directed to the settling pond via a silt trap; and
- Stockpiling and Despatch – The screened and washed material will be stockpiled and dispatched from the site to surrounding areas; and
- Silt trap maintenance – silt from the silt trap will be removed and stockpile as required and used in land rehabilitation.

1.6 LEGISLATIVE REQUIREMENTS

A number of legislative requirements are relevant to the operation of the Quarry. There are also various other standards and guidelines that may place constraints on the suitability of the site quarry operations. Those relevant to the proposed development include but are not limited to the following;:

- *Sustainable Planning Act 2009;*
- *Environmental Protection Act 1994;*
- *Environmental Protection Regulation 2008;*
- *Environmental Protection (Water) Policy 2009;*

- *The Environmental Protection (Noise) Policy 2008;*
- *The Environmental Protection (Air) Policy 2008;*
- *Environmental Protection (Waste Management) Policy 2000;*
- *Mining and Quarrying Safety and Health Regulation 2001;*
- *Work Health and Safety Act 2011;*
- *Work Health and Safety Regulation 2011;*
- *Work Health and Safety and Another Regulation Amendment Regulation (No. 1) 2013;*

And relevant Guidelines documents;

- *Code of Environmental Compliance – ERA 16 Extractive and Screening Activities; and*
- *Relevant Rockhampton Regional Council guidelines.*

Sustainable Planning Act 2009

As of the 18th December 2009 the Sustainable Planning Act 2009, now commonly referred to as SPA, came into effect to replace the planning and development laws under the Integrated Planning Act 1997. The Sustainable Planning Act 2009 forms the foundation of Queensland's planning and development assessment legislation. SPA establishes a simple step-by-step process for making, assessing and deciding development applications in Queensland and seeks to achieve ecological sustainability. The proposal to carry out an environmentally relevant activity (ERA) is defined in Chapter 1 Part 3 Division 3 of the Sustainable Planning Act 2009 as 'assessable development' and requires an Environmental Authority approval.

Environmental Protection Act 1994

The object of this Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (*ecologically sustainable development*). The development of a quarry and screening of material conforms to the definition of an environmentally relevant activity (ERA 16 (2)(b) and ERA 16 (3)(a)) as specified in the *Environmental Protection Regulation 2008*. The site currently operates under an existing Development Approval SPCE00734910 for ERA 16(2)(b) and 16(3)(a).

The EP Act also introduces a number of Environmental Protection Policies (EPP's) have been shown, considered applicable to this site, including;

- The Environmental Protection (Waste Management) Policy 2000 (Waste EPP) and the Environmental Protection (Waste Management) Regulation 2000;
- The Environmental Protection (Noise) Policy 2008;
- The Environmental Protection (Air) Policy 2008; and
- The Environmental Protection (Water) Policy 2009.

2.0 CONTROL MEASURES FOR ROUTINE OPERATIONS

2.1 GENERAL IMPACT

The impact to which the quarry may have on the receiving environment and public health must be managed in an appropriate manner. Accordingly, a summary of the expected discharges with regards to, air, noise, land, water or other contaminants have been summarised below.

2.2 GENERAL WASTE MANAGEMENT

A number of waste management procedures are proposed for the quarry and have been developed in accordance with the *Environmental Protection (Waste Management) Policy.*

It can be expected that general waste will be generated on-site due to operation of the quarry. Waste items may include:

- Packaging (Recyclable and non-recyclable);
- Waste chemicals;
- Food scraps and wastes; and
- Wastewater.

A direct objective of waste management procedures on-site is to ensure where on-site storage of all relevant solid and liquid wastes is required, appropriate management of these wastes is undertaken.

Small general refuse and recycling bins equipped with lids are to be located in the site office and lunch area (for such wastes as food waste, lunch wrappers, drink bottles etc.).

Hazardous material is not expected to be used on-site, however a designated storage area for this material, if utilised, is required.

It is understood that no water storage onsite will be made available for domestic purposes. A temporary toilet (transportable) to be pumped out as required will be provided to service the staff, contractors and sub-contractors.

No burning of vegetative material is to occur onsite.

All waste management procedures implemented are to be in general accordance with the EPP (Waste Management).

2.3 AIR

Direct discharges to air are likely to occur from the operation of the proposed quarry which may include: dust emissions from vehicle movement, excavation, screening and stockpiling; vehicle and machinery emissions (including carbon dioxide, monoxide, nitrous-oxide and sulphides). Dust control on-site will be managed in accordance with site specific dust mitigation procedures to be developed in accordance with industry best practice (i.e. watering, temporary sealing etc.).

Entrance/exit roads and any internal roads are expected to be unsealed (gravel roads). Quarry operations team members are responsible for the maintenance of these roads and the dust generated from their use. Trucks entering and leaving the site are to be confined to the designated roads and when leaving the site they are to have loads covered with tailgates effectively sealed where possible. It is expected that the quarry will routinely supress dust generation arising from internal vehicle access paths by operating a water truck on a scheduled program.

Exhaust emissions from the use of mobile plant and the movement of vehicles on-site is unavoidable. All vehicles, machinery and plant involved in operation of the quarry will be subjected to a scheduled and documented maintenance program. The maintenance program will assist in identifying and preventing vehicle, machinery and plant operating inefficiently and resulting emissions.

Quarry speed limits will be enforced for all vehicles accessing the site to reduce dust and vehicle emissions.

The processing of sand materials on-site via excavation, stockpiling and separating will most likely result in dust emissions. The mobile screening and washing plant will be equipped with the necessary enclosures/barriers/wind breaks and will be subject to a scheduled and documented maintenance program to be developed by the operator.

Stockpiles are to be kept to a minimum height with permanent or long term stockpiles to be stabilised with vegetation or other. Material stockpiles should have only one work face, where practicable and shall be wetted down before working, during dry and dusty periods. Where conveyer belts are used to transport and deposit onto stockpiles, the distance between the peak of the stockpile and release point of the conveyer belt is to be minimised to reduce the risk of dust surges. Low volume high pressure adjustable water atomising sprays are to be used where dust emissions occur.

2.4 NOISE

Noise will be generated as a result of the operation. The generation of noise can be attributed to the following activities:

- Operation of vehicles and plant associated with the movement of material on-site, delivery contractors and transport of material for delivery off-site; and
- Plant operation associated with the extraction and processing (screening and washing) of sand material.

It should be noted that the site is located away from sensitive land uses, and surrounded by rural land uses. The closest sensitive receptor is the residences located approximately 500m to the north of the site.

The likelihood of noise generated by the above activities to cause an impact on the surrounding area will be minimised by limiting hours of operation to 6:00am to 6:00pm, Monday to Saturday, with no works undertaken on Sunday or public holidays.

The proposed facility must be designed and operated to produce minimal noise emissions. Mechanical equipment where possible is to be fitted with noise reduction treatments, such as silencers, baffles etc. Where possible, equipment is to be securely fastened to reduce undue noise arising from vibrations. Noise limiting devices will also be used where possible to reduce excessive noise pollution.

All vehicles, plant and equipment will be operated in accordance with the manufacturers specifications.

Given the expected operational work hours and the fact that the facility will be sited at a suitable distance from potentially noise sensitive areas, limited noise impact is therefore likely to occur and will be managed in accordance with site specific noise mitigation procedures to be developed in accordance with industry best practice.

2.5 LAND

The site is proposed to consist of topsoil and overburden stockpiling area, wash and screening plant, excavation pit, sediment basins (settling ponds), washed product stockpile area ready for delivery, weighbridge, car park, site office and amenities and equipment storage.

The extraction footprint (refer Figure 2 Proposed Site Layout Plan), operational areas and sediment basins are to be located within previously disturbed grazing land on-site.

It is recommended that rehabilitation be undertaken progressively during quarry operations. All rehabilitation works will be in accordance with a *Site Rehabilitation Management Plan*.

As backfilling occurs, top soil will be spread and revegetated to stabilise the surface of all disturbed areas including slopes, extraction pits, stockpiles and sediment basins. Surface finishes such as grass or vegetation will be determined in accordance with future land use and surrounding areas and will be detailed in the *Site Rehabilitation Management Plan.*

Topsoil stockpiling is to occur in accordance with the *Site Rehabilitation Management Plan* and is to be managed in a way as to not degrade the resource. Compaction of soil is to be minimised and surfaces are to be left in a 'rough' condition as to promote water infiltration and minimise erosion prior to vegetation establishment. Stockpiles are to be no more than two (2) meters high to ensure biological viability. Long term bunds and stockpiles are to be appropriately stabilised with grass or other vegetation. Weed management will be undertaken as needed.

Appropriate erosion and sediment control measures will be implemented onsite to minimise the mobilisation of sediment to downstream catchments, and maintain longevity of on-site drainage infrastructure.

Spill kits will be kept on-site sufficient to contain the largest potential fuel/oil spill from vehicles, plant and machinery on-site.

No release of waste products are envisioned for release to land. A temporary toilet to be pumped out as required will be provided to service the staff, contractors and sub-contractors.

A previous preliminary Acid Sulphate Soil (ASS) investigation determined low risk of ASS in the north east corner of the site, though surface soils may be considered to constitute acidic properties. As such it is prudent that monitoring of surface water runoff from stockpiled material prior to release to ensure no impact to receiving environments occur. Furthermore, additional ASS investigation is recommended for stages not included in the scope of the preliminary ASS investigation.

2.6 WATER

Stormwater management will be undertaken in accordance with industry best practice including *IECA Best Practice Erosion and Sediment Control 2008*. Stormwater management will focus on erosion and sediment control, management of on-site surface water flow and aim at limiting the impact on the receiving environment.

The main potential sources of sediment during operations include the removal of topsoil and stockpiling, washing of sand product, as well as uncontrolled run-off from active extraction areas, roads and drainage areas.

The principal design aspects of the quarry will incorporate the diversion and separation of upslope 'clean water' runoff from the 'dirty water' (runoff generated in disturbed areas onsite) so as to minimise and isolate the amount of 'dirty water' runoff. The 'clean water' will be directed around the or through the site in a non-erosive manner and the 'dirty water' will be diverted to the sediment control basins (settling ponds).

All wash water from the sand washing process will be directed to the on-site sediment basins (settling ponds).

The following controls will be implemented:

- Long term stockpiles (topsoil / overburden / silt) to be adequately stabilised and placed out of flow paths;
- Diversion drains / mounds to placed upslope of the activity to divert clean upslope surface water around the perimeter of the site;
- All dirty water generated from runoff on exposed surfaces and sand wash water is to be directed to on-site sediment basins (settling ponds);
- All clean water and dirty water diversion/collection drains to be appropriately stabilised;
- Dimensions of drains and sediment basins to be designed in accordance with *IECA Best Practice Erosion and Sediment Control 2008*;

- Check dams to be installed if required;
- Energy (flow) dissipaters are to be installed at exit points.

All sediment basins (settling ponds) should be constructed as per the *IECA Best Practice Erosion and Sediment Control 2008* including stabilised entry and exit points and spillways afforded. Sediment basins to be constructed to prevent release of contaminants through the bed and banks to any groundwater.

Topsoil on-site has been assessed as containing potential acidic properties. As such all surface water runoff from stockpiled topsoil will be directed to on-site sediment basins (settling ponds).

In the event that discharge of water from sediment basin is required, or overflow to downstream catchment is likely with impending rainfall event, the water quality is to be monitored to determine suitability prior to discharge. Sediment basin discharge to meet the following water quality criteria as a minimum:

- TSS (max) 50mg/L;
- pH (range) 6.5 – 8.0; and
- Other EA requirements.

Water, erosion and sediment controls will be routinely inspected, including before and after each rainfall event, and any damage will be repaired to ensure correct functioning.

Any groundwater intercepted during the extraction process will need to be appropriately managed. Should groundwater be required to be removed prior to extraction, groundwater must be directed to the on-site sediment basins (settling ponds). Groundwater drawdown must be kept to the absolute minimum for allowable excavation of sand. A groundwater monitoring network and program may be required.

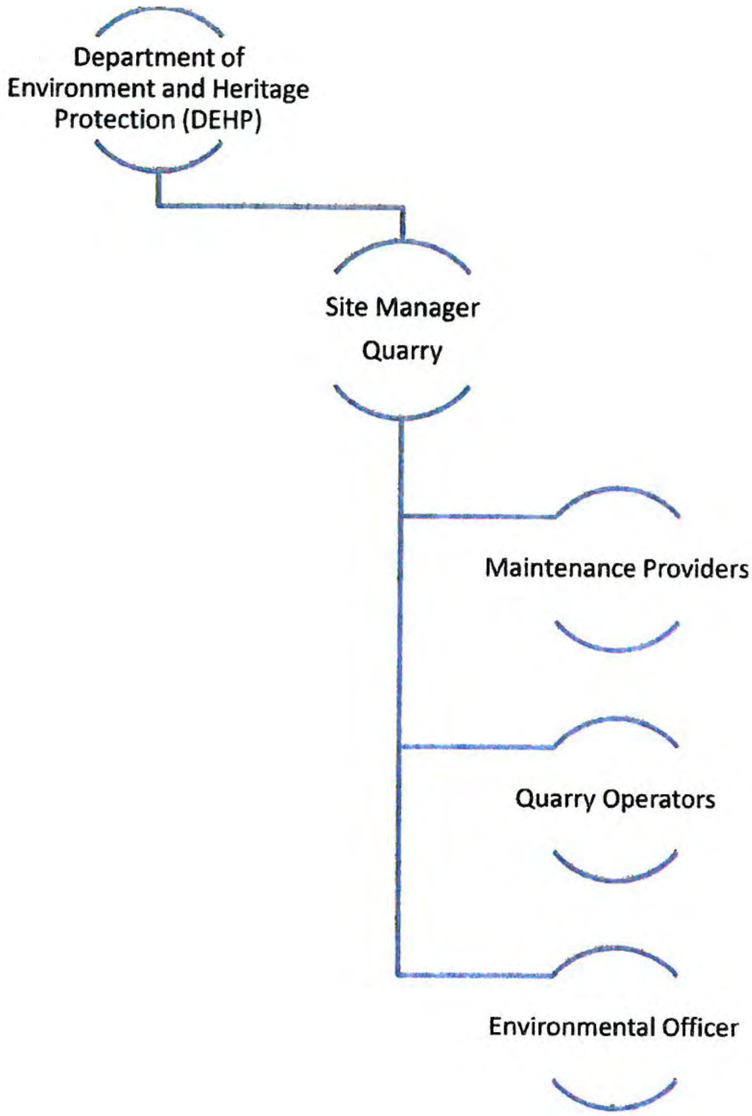
3.0 RESPONSIBILITIES MATRIX

3.1 GENERAL

The proposed development is considered to be sustainable; however this relies on the satisfactory implementation of the above nominated quarry management methods, during the day to day operations. Responsible person's on-site will be nominated to ensure that methods and systems are maintained in accordance with the relevant technical specifications, and also operational within the framework of General Environmental Duty.

To ensure that this occurs, the hierarchical designation of responsibilities is required to ensure a clear and concise response to expected issues which may arise as a result of the operation of the facility. The proposed structure of responsibility is shown in Section 3.2 below.

3.2 RESPONSIBILITY MATRIX



Department of Environment and Heritage Protection – Managing Authority for Existing ERA 16(2)(b) and 16(3)(a)

DEHP shall be responsible for:

- Review Development Approval conformance as required; and
- Provide comments as necessary.

Quarry – Site Manager

The Site Manager shall be responsible for:

- Collation and retainment of all relevant site data for minimum 5 years;
- Forwarding data to DEHP in accordance with Development Approval conditions;
- Appropriate training/awareness for all staff members involved on the site;
- Ensuring responsible staff member/s monitor the systems in accordance with the SBMP, (and other on-site management plans as required);
- Review, update and maintain this SBMP;
- Review and update of new information or technology which may be applicable to this SBMP;
- Complaints response;
- Organisation of the site to ensure the requirements within this SBMP can be maintained and implemented;
- Ensure all plant equipment, machinery and vehicles are maintained and operated in accordance with the manufacturers requirements;
- Coordination and engagement of servicing and performance monitoring of quarry operations; and
- Coordination and engagement of licenced waste contractor for pump out of temporary toilet.

Quarry Operators and Maintenance Providers

The quarry operators and maintenance providers shall be responsible for:

- Response to non-conformance events as directed by the Site Manager or Service Manager;
- Conduct on-site operations in accordance with this SBMP;

- Repair or replacement of plant components as necessary; and
- Servicing the plant and reporting any operational or maintenance issues to the Site Manager.

Environmental Officer

The Environmental Officer/s shall be responsible for:

- Environmental monitoring and inspections/auditing as required; and
- Reference point of contact for environmental operations and controls.

4.0 CONTINGENCY & EMERGENCY PROCEDURES (HEALTH & ENV.)

4.1 GENERAL

The risk of environmental or public health issues occurring may be minimised where the routine operating control measures described in Section 2.0 of this SBMP are followed.

Certain non-conformances have the potential to cause harm and therefore must be appropriately responded to, rectified and recorded. The following Section of this SBMP details the process for recording and responding to incidents.

4.2 ENVIRONMENTAL AND PUBLIC HEALTH

Response to incidents or emergencies that can compromise the quality of the nominated quarry operations and systems are essential. All incidents must be reported immediately to ensure that the appropriate response is achieved.

Requirements

Communication is the key objective to ensuring appropriate incident response and action occurs efficiently. The Site Manager will ensure that effective communication lines are maintained with the relevant agencies and/or the applicable regulatory authorities during major events. General information to be provided in such an incident may include the following;

- The site details;
- The nature and cause of the incident;
- Location of the incident;
- Time records of the incident;
- The public or environmental health nuisance caused, threatened, or suspected to be caused by the incident;
- Actions undertaken to remedy the issue or incident; and
- Mechanisms proposed to minimise future incident.

The environmental incidents register form is to be completed by the Site Manager, or approved delegate in the absence of, for all incidents. Actions undertaken to mitigate the incident will accord with the contingency strategies in this SBMP. If no contingency plan exists the Site Manager may liaise with the relevant persons in order to establish a suitable corrective action and response strategy.

This form is to be completed by the Site Manager for all incidents. Appropriate direction from the relevant regulatory authorities may be required to ensure the appropriate corrective actions have been undertaken.

A typical Environmental Incident Response form has been shown below:

ENVIRONMENTAL INCIDENT REGISTER FORM

Quarry

Report to be completed by person who discovered incident/non-conformance

Report number: ____________________

Date of incident/ non-conformance: ____________________

Approx. time of incident/non-conformance: ____________________

Plant, facility or location where incident/non-conformance occurred:

____

Problem: spill leak fire systems

Environment impacted: air ☐ land ☐ water ☐ other ☐

Person reporting incident/non-conformance: ____________________

Witnesses: ____________________

Description of incident/non-conformance: ____________________

____

Outcome of incident/non-conformance (environmental impacts): ____________________

____

ENVIRONMENTAL INCIDENT REGISTER FORM

Quarry

Report to be completed by person who discovered incident/non-conformance

How did incident/non-conformance occur? ______________________

____

What action was taken to immediately fix problem? ______________________

____

What actions are required to prevent recurrence in future? ______________________

____

Does incident/non-conformance need to have a procedure developed to prevent recurrence?

Yes: ☐

No: ☐

Any further notes: ______________________

Manager sign off: ______________________

Date: ______________________

Email/Fax/Post to:

☐ Site Manager

☐ Department of Environment and Heritage Protection

☐ Council

☐ Others ....

4.3 CONTINGENCY MEASURES

A number of contingency and corrective action measures have been detailed in the following sections. The contingencies address the requirements likely to be associated with the ongoing operation of the proposed Quarry.

4.3.1 INJURIES OR MEDICAL EMERGENCY

Injuries/incidences arising due to workplace activities contained with the facility and surrounding land use.

Corrective Action

- Site manager to ensure that all provisions are made to mitigate any future risks.
- All unsafe work conditions or unsafe behaviour must be reported to Site Manager in order to prevent injuries, illness and accidents.
- Adequate signage will be erected around potentially dangerous areas and at the site entrance to notify incoming personnel of deep excavation operations and steep cliffs.
- All personnel will sign in at the site office upon entering the site so all personnel on-site are accounted for.
- All site rules will be adhered to in order to minimise the risk of injury from operating machinery or conducting any other quarry related task.

Responsibility

- Site manager and all staff to thoroughly understand emergency procedures.
- All Staff to work in a safe manner and report all potential unsafe working conditions or behaviour.

4.3.2 FIRE

It is important to consider likelihood of fire outbreak and with this in mind, preventative measures that can be conducted on-site. Response to fire outbreak should be rapid and staff should be made aware of response procedures in the case of fire.

Corrective Action

- Develop a response plan aimed at addressing the awareness and the mechanisms necessary for a fire response.
- Develop a comprehensive fire prevention plan and ensure all staff members have a good understanding.
- Increase awareness to all concerned the need for fire prevention and response.
- Ensure fire-fighting equipment is easily accessible and visible, thus allowing for quick response.
- Report fire outbreak to relevant authority.
- Develop and operate in accordance with Emergency Management QLD / QLD Fire and Rescue.

Responsibility

- Site Manager is to ensure fire prevention and response methods are in place.
- All site staff to ensure fire prevention methods are undertaken during works.

4.3.3 NATURAL HAZARDS

Natural hazards such as bush fire, floods or storms can cause serious damage and loss of life. It is important to be aware of the potential of such events and to ensure that appropriate measures are in place to minimise the risk of natural hazards.

Corrective Action

- Reduce the risk of bush fire by cleaning gutters of leaves, clearing land of rubbish and dead vegetation, and maintaining grounds.
- Be aware of high rainfall/wind events and weather warnings.

Responsibility

- Site Manager is responsible for monitoring and maintaining vegetation around buildings and weather warnings.

4.3.4 TRANSPORT AND HEAVY MACHINERY

The transportation of quarry material has the potential to cause hazards to the public, however the management of traffic leaving the site will minimise this risk. Operating and working around large machinery has the potential to cause serious harm and risk minimisation will need to be undertaken.

Corrective Action

- Ensure all loaded vehicles leaving the site are covered to prevent spillage of quarry material to the public road system.
- Vehicle shakedown will be constructed on the access road.
- All machinery must meet relevant regulations with maintenance occurring on a regular program.
- Operators of heavy machinery are to be appropriately qualified and licensed accordingly.
- All personnel are to hold relevant licences and trained for working around heavy plant and be aware of the limits of the machines intended use.
- All operators and support personal must have and use PPE.
- All personnel must be alert to where machinery is operating and be aware of blind spots and other possible sensory impairment that may be caused by factors such as dust and noise.
- Machinery can have surfaces that may lead to slips, trips and falls. All personnel must use wear appropriate foot wear and use steps as provided. Any hazards produced by machinery should be isolated with tape/barricades and covered/repaired as soon as possible.

Responsibility

- Site Manager is to ensure management response methods are in place.
- All site staff to be appropriately qualified and licenced for the applicable activity and trained in machinery operations and potential hazards when working around large machinery.

4.3.5 CHEMICAL AND FUEL SPILLS

Management of chemical spills on-site is required to minimise effects to health and safety from exposure to chemical spills as well as mitigate any impact to the receiving environment.

Corrective Action

- Ensure a spill kit is easily accessible and clearly labelled. This kit should contain;
    - A container large enough to hold a spillage of the largest container of liquids used in the immediate area.
    - Material to absorb spilt liquids (i.e. kitty litter, saw dust or sand).
    - Brooms and dust pans to sweep up the absorbent material.
    - Absorbent pillows or booms to contain larger liquid spills and prevent spills entering drains.
    - Heavy duty plastic bags or plastic drums (with a lid) to contain hazardous material prior to disposal.
    - Appropriate personal protective clothing (such as chemical resistant gloves, safety glasses).
- Ensure that all staff are aware of and can access the chemical spill management and chemical spill guidelines, and know how to use the spill kit in the case of an emergency.
- Immediately bund the spill and absorb the spill using sand/sawdust or similar material that has absorption qualities. Dispose of this material appropriately at licenced facility. Do not wash spill down a drain or outside.

- Spill kits should be restocked following use and the contents should be checked on a monthly basis.
- Review Material Safety Data Sheet if applicable.
- Record event in Environmental Incident Register.

Responsibility

- Site Manager is to ensure chemical spill kits and management response methods are in place; and
- All site staff to be trained in chemical spill management.

4.3.6 SEDIMENT BASINS (SETTLING PONDS)

Management of detention basin releases (within design storm events) is required to prevent worsening effect on downstream water quality.

Corrective Action

- Ensure sediment basins, and all other ESC measures, maintained in accordance with the *IECA Best Practice Erosion and Sediment Control 2008*;
- Inspections of the sediment basins to be undertaken prior to, during and following rainfall events;
- Sediment basin discharge to meet the following water quality criteria as a minimum:
  - TSS (max) 50mg/L;
  - pH (range) 6.5 – 8.0; and
  - Other EA requirements.
- If discharge is required, initiate laboratory testing prior to release to determine water quality meets above discharge limits;
- If required, sediment basins to be appropriately treated to meet above discharge limits;

- Site manager to ensure licensed waste contractor on standby in case required treatment unable to be achieved or verified prior to rainfall event leading to overtopping;
- In case of release of water non-conforming with the above discharge limits, record event in Environmental Incident Register and notify relevant authority.
- Immediately clean up any sediment deposition downstream of sediment basin and place back on Quarry site;
- Ensure sediment basins maintained i.e. sediment removal as required, exit entry points stabilised etc.

Responsibility

- Site Manager is to ensure the nominated controls are complied with, ensure sediment basins appropriately managed and any releases meet specified discharge limits associated with design rainfall events;
- Environmental service provider is to sample sediment basin as required by site Manager; and
- All site staff to be trained in sediment basin management.

5.0 MANAGEMENT OF COMPLAINTS

5.1 GENERAL INTENT

All complaints received as a result of operation of the facility are to be handled in a responsible manner. The complaints response system implemented as part of this SBMP is to be continually monitored and upgraded as necessary. Complaints submitted to the Site Manager or other staff members must be recorded and appropriately responded to within the shortest possible time allowable. Complaints may be in the form of either written or verbal, in response to the operation of systems. Documentation, investigation and response of the complaints, and the procedural requirements have been detailed below.

5.2 REQUIREMENTS OF ENVIRONMENTAL COMPLAINTS

The Environmental Complaints Register is required to be commissioned prior to the operation of the proposed systems. The general reporting documentation has been included in the form below detailed as the 'Environmental Complaints Register Form'. The form is to be managed and maintained by the Site Manager or equivalent person of imposed authority. All public complaints received shall be addressed in the following manner:

1. All complaints shall be registered immediately with the following details:
    - Name, contact, location and general nature of complaint;
    - Proposed steps to investigate complainants requests;
    - Method of notification by complainant; and
    - Regulatory Authority notified (if applicable).
2. The Site Manager is to describe the general complaint and identify the incident.
3. The Site Manager proposes the corrective action required and direct staff accordingly.
4. The Site Manager must investigate the nature of the complaint and advise the complainant of the action proposed (within 2 business days of action undertaken).

   The Site Manager must ensure that the action proposed will not cause further issues.

5. If applicable, the Site Manager (or equivalent) is to ensure steps are taken to correct the cause of the complaint. The Site Manager is to ensure that the incident is rectified with the appropriate resources made available.
6. The response time for action should be prioritised as to the potential impact the development may have on the environment or public health.
7. The Site Manager may then update the appropriate form advising of the steps undertaken, and resolution date of the actions undertaken.
8. The records of all complaints received, and Complaints Register Forms completed shall be retained for a minimum of five (5) years by the Site Manager.

Environmental Complaints Register Form

Completed by ____________________ on this date __________

Company: ____________________

Position: ____________________

Other Comments ____

Complaint received by ______________ on this date __________ via ______________

Contact Details of Complainant

Name ______________ Address ____________________

Ph __________

Description	
Incident	
Corrective action determined	
Notice of action undertaken forwarded to complainant	
Site Manager follow up of incident	
Future management strategy to minimise re-occurrence	
Other comments	

Further Action Required:

Further Action Completed:

Email/Fax/Post to:	Contact	Address
Department of Environment and Heritage Protection		
Council		
Service Manager		
Maintenance Provider		

6.0 STAFF TRAINING, RECORD KEEPING AND PERIODIC REVIEW

6.1 STAFF TRAINING

Staff training is an integral part of ensuring the viable and sustainable operation of the quarry. It is imperative that the site staff members are aware of the specific roles and responsibilities associated with the operation of all systems. The Site Manager is responsible for ensuring that the ongoing staff training and awareness program, including the provisions of the SBMP are implemented. Regular and effective communication between the Site Manager and the relevant persons is required.

The Site Manager is to be supplied with all relevant manuals, controls, procedures and directions from any plant manufacturers.

6.2 RECORD KEEPING

Record keeping will be maintained on the site by the Site Manager. Records will be kept for a period no less than 5 years. All correspondence received from the regulative authorities must also be retained on-site. Service and maintenance records must also be retained for future reference.

6.3 PERIODIC REVIEW

This SBMP will require periodic review. The focus of the periodic review is how the Site Manager ensures the quality of the provision and maintains environmental and public health standards. It may also address the way in which the management procedures and specific actions evolve over time; ensuring operations remain at the forefront of sustainability.

The review should endeavour to set out recommendations and identify examples of the most appropriate methods, and how they may improve. The Site Manager may then produce an action plan defining the proposed changes and the implications for the management of the proposed systems, to best suit the site. Consultation with the relevant Service Manager, staff and relevant regulatory authorities may be required prior to implementation.

7.0 MONITORING AND IMPACT ASSESSMENT

7.1 GENERAL

A monitoring program has been developed for the site to ensure that the nominated operational and maintenance procedures are effective in minimising the risks to public health and the surrounding environment typically associated with activities on-site. The monitoring program focuses upon safety, environment, quality and general operating processes to ensure the facility continues to meet the requirements of the development approval and relevant guidelines.

Details relating to the frequency of monitoring, contaminants to be monitored and relevant control limits have been specified in Table 2 below.

Table 2: Monitoring Requirements for the Proposed Quarry

Monitoring type	Frequency	Parameter	Procedure
Quality of storm water discharge	If and when requested by DEHP or Rockhampton Regional Council, or when discharge to downstream catchment is required or likely	pH Electrical Conductivity Total Suspended Solids (TSS) Visible oil and grease Heavy Metals	DEHP (2009) Monitoring and Sampling Manual, Environmental Protection (Water) Policy and; AS5667.1:1998 Water Quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.
Groundwater	As requested	Level	DEHP (2009) Monitoring and Sampling Manual, Environmental Protection (Water) Policy and; AS5667.1:1998 Water Quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.
Noise[1]	Complaint driven / as requested by DEHP or Rockhampton Regional Council	Decibels	AS –1259.1
Vibration[1]	Complaint driven / as requested by DEHP or Rockhampton Regional Council	TBA	AS –1259.1
Air	Complaint driven / as requested by DEHP or RRC Council	ppm (m^2)	TBA

NOTE 1 Using AS – 1259 1

7.2 REPORTING

Records shall be kept and retained for at least five (5) years for the following:

- All sampling and analysis results from requested stormwater monitoring;
- Any incident reporting or maintenance requirements following inspections carried out as part of the monitoring process necessitated by the SBMP; and
- All complaints as documented earlier.

7.3 NOISE MONITORING

Noise monitoring may be initiated upon receipt of a complaint. Investigations must then be performed by a qualified person and reported in accordance with the relevant requirements as set out by the DEHP.

7.4 VIBRATION MONITORING

Vibration monitoring may be initiated upon receipt of a complaint. Investigations must then be performed by a qualified person and reported in accordance with the relevant requirements as set out by the DEHP.

7.5 AIR MONITORING

Air monitoring for particulate substances may be initiated upon receipt of a complaint. Investigations must then be performed by a qualified person and reported in accordance with the relevant requirements as set out by the DEHP.

8.0 CONCLUSION

This SBMP has been prepared for the proposed expansion of the Quarry at Nine Mile Road, Fairy Bower. The Quarry will extract, screen, wash and stockpile sand material, to be then sold as a commodity to customers in and around the Rockhampton area.

As part of the on-site quarry operations a number of management strategies have been proposed to mitigate foreseen circumstances, in the routine operation of the systems. The management strategies have addressed such issues as Injuries, Fire, Natural Hazards, Transport and Heavy Machinery and Chemical and Fuel Spills. Also, the SBMP addresses the necessary requirements in managing environmental non-conformance incidents.

Provided the efforts incorporated into this SBMP and can be maintained and improved upon in the future, the proposed facility will be able to operate in a sustainable manner. In addition, this SBMP and its supporting documents have demonstrated limited risk of impact to environmental and public health as a result of the proposed development.

FIGURE 1

SITE LOCALITY PLAN

(Refer Page 3 of This Report)

FIGURE 2

PROPOSED SITE LAYOUT PLAN

****AMENDED PLAN TO BE INSERTED WHEN MADE AVAILABLE****

APPENDIX 1

REHABILITATION MANAGEMENT PLAN

****TO BE INSERTED WHEN MADE AVAILABLE****

SCHLENCKER SURVEYING Est. 1973

Rockhampton - Brisbane - Gold Coast

Consultants in Surveying, Mapping & Development

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181 East St.
PO Box 1337
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Ph (07) 4927 1744
Fax (07) 4922 3164
mail@schlencker.com.au

Our Ref: 5652:CRS:RAS
Your Ref: D/225-2010

30 November, 2010

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current conditions of approval associated with
Development Permit No. D/589-2013
Dated: 11 September 2014

The Chief Executive Officer
Rockhampton Regional Council
PO Box 1860
ROCKHAMPTON QLD 4700

Dear Sirs,

RE: DEVELOPMENT APPLICATION 225-2010
FOGARTY ROAD, FAIRY BOWER
LOT 250 ON RP2621, LOT 4 ON LN883 & LOT 1 ON RP603316
FOR JOHN FOXLEE

We enclose herewith the following:-

1. Response to Information Request to Department of Transport and Main Roads dated 29 November, 2010; and
2. Response to Information Request to Department of Environment and Resource Management dated 29 November, 2010.

Please do not hesitate to contact our office should you require any further information.

Yours faithfully
SCHLENCKER SURVEYING

A.M. CUMNER
Cadastral Surveyor

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Our Ref: 5652:AMC:caw
Your Ref: 830/1144 KMA:lzj E51568 (DCT 1424

29 November, 2010

The Regional Director
Department of Transport and Main Roads
Corridor Management and Operations
Fitzroy Region (Rockhampton Office)
PO Box 5096
Red Hill
ROCKHAMPTON QLD 4701

Dear Sir/Madam

RE: **Proposed Material Change of Use – Impact for Extractive Industry**
Application No. D/225-2010
Lot 250 on RP2621, Lot 4 on LN883 & Lot 1 on RP603316
Situated at 473 Nine Mile Road, Fairy Bower for John Foxlee

Further to your Request for Additional Information dated 21 July, 2010 we attach a copy of McMurtrie Consulting Engineers Road Impact Assessment Report issued 11 November, 2010)

Please do not hesitate to contact our office should you have any queries.

Yours faithfully
SCHLENCKER SURVEYING

A.M. CUMNER
Cadastral Surveyor

McMurtrie
consulting engineers

63 Charles Street
North Rockhampton
Queensland 4701
PO Box 2149
Wandal Qld 4700

Phone 07 4921 1780
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Email mail@mcmengineers.com

ABN 69 958 286 371

11 November 2010

Our Ref: 026-10-11
Your Ref: 830/1144 KMA:lzj E51568(DCT 1424)

Department of Transport and Main Roads
Fitzroy Region (Rockhampton Office)
P.O. Box 5096
Red Hill
Rockhampton Q 4701

Att: Mr Terry Hill
Re: Proposed Material Change of Use – Impact for Extractive Industry
Application No. D/225-2010
Lot 250 on R2621, Lot 4 on LN883, and Lot 1 on RP603316
Nine Mile Road, Fairy Bower

Dear Sir,

Reference is made to the Department of Transport and Main Roads Request for Additional Information dated 21 July 2010. We herewith submit all of the above information requested, and request that the Department proceeds with the assessment of the application.

McMurtrie Consulting Engineers have been engaged by the Applicant (Mr John Foxlee) as suitably qualified Registered Professional Engineers Queensland (RPEQ) for the purposes of undertaking the Road Impact Assessment (RIA) in accordance with the Department of Transport and Main Roads' (DTMR) 'Guidelines for Assessment of Road Impacts of Development (GARID)' on the State-controlled Roads (SCR). In addition the assessment of Local Government Roads (LGR) Traffic Engineering Assessment has been carried out in accordance with the guidelines developed in a meeting with Mr Bruce Russell (RRC) and confirmed in a letter dated 9 September 2010 (Appendix A).

The Traffic Engineering Assessment will address the items detailed in Bruce Russell's electronic mail dated 7 September 2010 (Refer Appendix A).

Background

Market research by the Applicant has identified a current deficiency in the supply of screened sand to local suppliers and manufactures of concrete products. As a result, the Applicant is entering into a joint venture arrangement (under separate MCU Applications) with an adjoining land owner (Mr Paul Waardyk) to extract, process, stockpile and transport sand from the subject site/s for customers in and around the Rockhampton area.

Development Profile

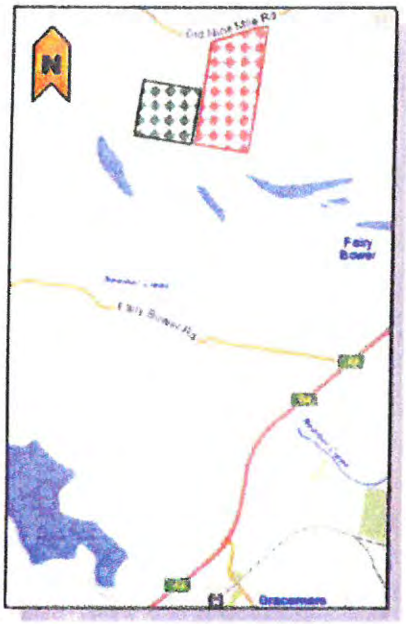
The intent of the joint venture is to establish a processing facility on Lot 432 on LIV401245 (owned by Mr Paul Waardyk) and extract the sand from the 2 sites in 2 phases. Phase 1 will involve sourcing sand from Lot 250 on R2621 (owned by Mr Foxlee) and transporting it across Fogarty Road (along the Unnamed Road reserve between Lot 432 on LIV401245 and 257 on LN882) to the processing facility (refer Appendix D for Site Layout Plan). Once the material source is depleted on Lot 250 on R2621 the extractive industry (Phase 2) will commence on Lot 432 on LIV401245. The screening plant will remain on Lot 432 on LIV401245 for the duration of the extractive industry permit.

During both phases the screened sand will be stockpiled onsite (Lot 432 on LIV401245) and be collected by customer arranged transport for delivery to various sites as demand dictates.

The venture aims to target concrete manufacturing and ready-mix suppliers in the Rockhampton area. Although contracts have not been secured, it is envisaged that the majority of the quarry products will be delivered to these three (3) major Companies:

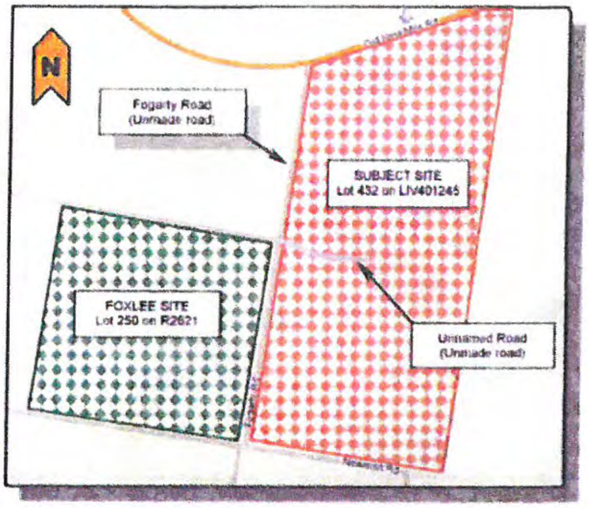
- Holcim (Australia), Concrete Plant at Knight Street
- Tandy Concrete, Pre-cast & Concrete Plant at Williamson Street
- Holcim (Australia), Pre-Cast Plant at McLaughlin Street

As part of the extraction and processing operation in Phase 1, articulated trucks will be utilised to cart sand from Lot 250 on R2621 to Lot 432 on LIV401245, crossing Fogarty Road at the Unnamed Road intersection. Deliveries to and from the processing facility will then utilize the Fogarty Road reserve for access onto Nine Mile Road. Refer site plan below:



◄ Figure 1: Proposed location of Site

▼ Figure 2: Close-up of proposed location of Site



Proposed Transport Route – SCR and LGR Networks

From the processing facility, delivery vehicles will utilize the internal ring road arrangement (refer Appendix B for Site Layout Plan) to access onto Fogarty Road. Trucks will then use the Nine Mile Road network to traverse over to Ridgelands Road and into the Rockhampton (Wandal) area.

At present the Fogarty Road frontage to this development is unconstructed (unmade); although there is evidence of infrequent use of the existing 'unmade road' by local residents as a 'dry weather / all-terrain vehicle' short-cut. The proposed upgrade to Fogarty Road will be discussed later in this report.

As mentioned, the development will focus on 3 major companies in the Rockhampton area; these sites are located in the figure below;

1. Holcim (Australia), Concrete Plant at Knight Street
2. Tandy Concrete, Pre-Cast & Concrete Plant at Williamson Street
3. Holcim (Australia), Pre-Cast Plant at McLaughlin Street

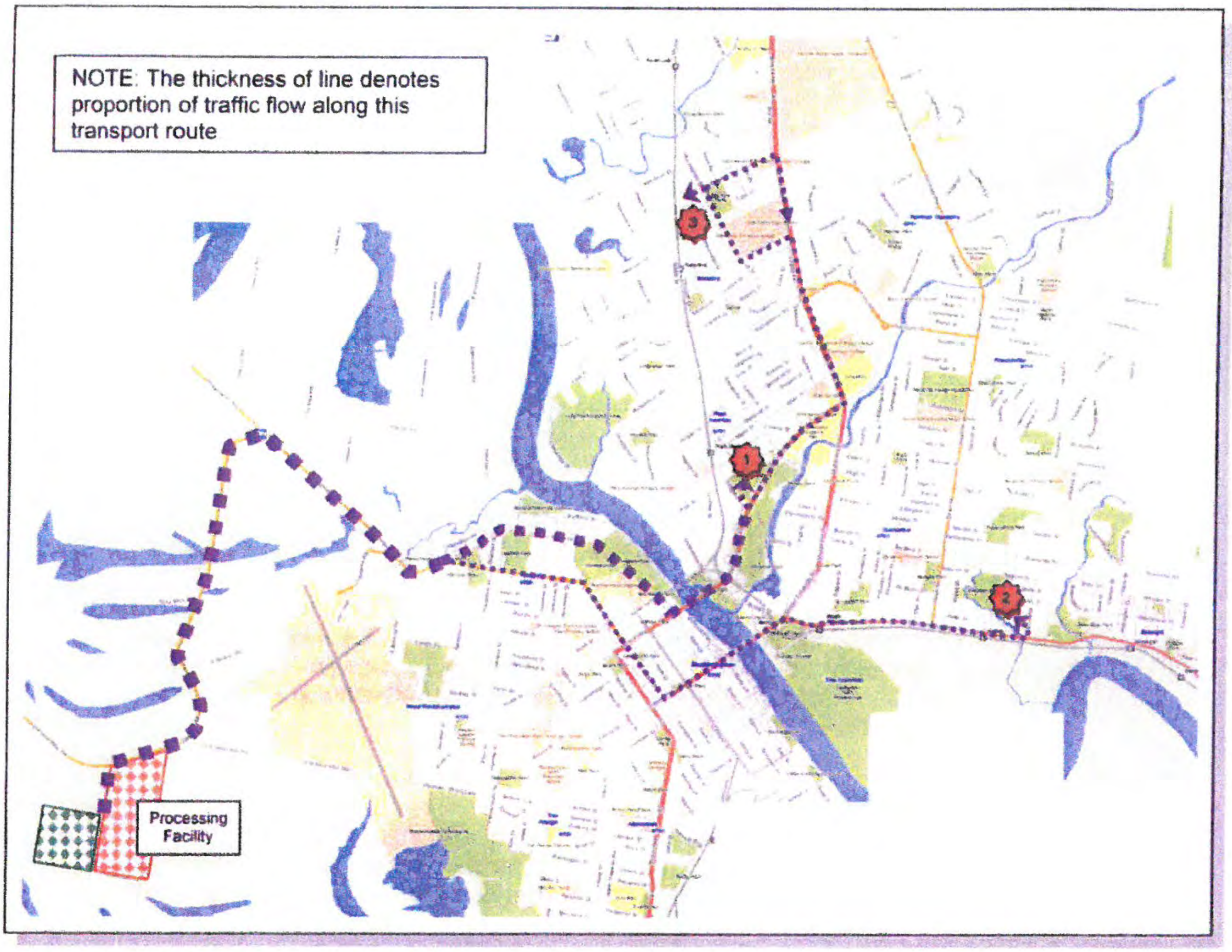
◀ Figure 3:
Proposed delivery Sites 1, 2 and 3.

◀ Figure 4:
Proposed delivery Sites 1 and 2.

Figure 5: ▶
Proposed delivery Site 3.

The following figure details the proposed transport route to be utilized for the delivery to these major suppliers.

▼ Figure 6: Proposed Transport Route



The following details the LGR and SCR networks utilized for the delivery of quarry products to Sites 1, 2 and 3.

Site 1. Holcim (Australia) - Concrete Plant

- Fogarty Road (LGR)
- Nine Mile Road (LGR)
- Rockhampton – Ridgelands Road (SCR)
- Lion Creek Road (LGR)
- Exhibition Road (LGR)
- Bolsover Street (LGR)
- Bruce Highway (SCR)
- Knight Street (LGR)

Site 2. Tandy Concrete - Pre-Cast & Concrete Plant

- Fogarty Road (LGR)
- Nine Mile Road (LGR)
- Rockhampton – Ridgelands Road (SCR)
- Campbell Street (SCR & LGR)
- Fitzroy Street (SCR)
- Rockhampton – Emu Park Road (SCR)
- Thozet Road (LGR)
- Williamson Street (LGR)

Site 3. Holcim (Australia) - Pre-Cast Plant

- Fogarty Road (LGR)
- Nine Mile Road (LGR)
- Rockhampton – Ridgelands Road (SCR)
- Lion Creek Road (LGR)
- Exhibition Road (LGR)
- Bolsover Street (LGR)
- Bruce Highway (SCR)
- Farm Street (LGR) – one way only
- McLaughlin Street (LGR) – one way only
- Carlton Street (LGR) – one way only

From the proposed transport route the identified SCR's will be assessed in accordance with the GARID requirements for pavement and operational impacts from development generated traffic.

As Rockhampton Regional Council does not have any prescribed assessment criteria or guidelines, the LGR's will be assessed in accordance with Mr Bruce Russell's advice provided in his electronic mail dated 07/09/2010 and confirmed in letter dated 9 September 2010 (Refer Appendix A).

Development Generated Traffic Volumes

The processing facility will utilise 1 x Tandem Truck with Quad Dog trailer for pre-arranged delivery of quarry products. As the general intention of the development is processing and stockpiling, it will generally be the responsibility of the purchaser to arrange transportation of the materials.

From anticipated production information provided by the Applicant the processing facility will produce 50,000 tonne of sand per annum, however for the purposes of the pavement impact assessment the analysis will be based on the maximum Extractive Industry Threshold limit of 100,000 tonnes applied for in the Material Change of Use. Although it is not envisaged that the development will exceed 50,000 tonne in the first few years, the 100,000 tonne upper limit will cater for possible future demand as business improves.

Given the 100,000 tonne annual production limit and assuming 288 working days per year (based on 48 working weeks/year x 6 working days/week), the expected heavy vehicle (HV) movements associated with the delivery of sand is 10 trips per work day. This is based on a Tandem Truck and Quad Dog trailer configuration with 36 tonne payload.

Operationally, the processing facility is plant (machinery) intensive and will only require a maximum of 3 operators / drivers onsite at any one time. As part of the forecast business operations at the proposed development, it is anticipated that no more than 17 vehicle trips (10 x HV, 3 x Workers SHIFT START/END, 3 x Workers

SHIFT LUNCH and 1 x Maintenance Ute) will be generated from the site per working day. This figure includes all staff movements, maintenance visits and product transportation shipments.

Therefore, a total of 34 daily vehicle movements (2 movements = 1 trip) are generated from the proposed site each trading day.

SCR Traffic and Pavement Data

Site specific traffic and pavement data required for the RIA analysis has been sourced and supplied (refer Appendix C) by Departmental Officer – Mr Robert Hicks (Senior Engineer – Asset and Operation Division, Rockhampton Office) and covers:

- Total Bituminous Seal Width (m)
- Average Road Roughness (counts/km)
- Average Annual Daily Traffic volume (veh/day)
- Percentage Heavy Vehicle (% of AADT)
- Through Distance identifiers (Gazettal chainage)

For the purposes of this assessment the scope of the RIA investigation and analysis has been confined to the following SCR's:

- Rockhampton – Ridgelands Road and Campbell Street (511)
- Bruce Highway (10F)
- Fitzroy Street (196)
- Rockhampton – Emu Park Road (194)

ROAD IMPACT ASSESSMENT (RIA)

The RIA comprises of two (2) forms of evaluation, the Pavement Impact Assessment (PIA) and the Traffic Operation Assessment (TOA). In accordance with the GARID these two evaluation criteria are detailed below:

SCR Pavement Impact Assessment (PIA)

A Pavement Impact Assessment is required when operational traffic generated from a proposed development equals or exceeds 5% of the background Equivalent Standard Axles (ESA's) loadings on the SCR network.

With the assistance of the DTMR PIA Spreadsheet (developed and supplied by Mr Robert Hicks) the relevant traffic and pavement data has been analyzed and a summary of results are shown below:

Road Name	Section	Length (km)	HV Dev Loading (% of total)	2011 Background ESA's	2011 Development ESA's	% of Background
511	Bruce Highway - Show Grounds	0.8	33.3%	2.62×10^5	7.03×10^3	2.7%
511	Show Grounds - Western Street	1.2	33.3%	1.87×10^5	7.03×10^3	3.8%
511	Western Street - Lion Creek Road	0.2	33.3%	1.64×10^5	7.03×10^3	4.3%
511	Lion Creek Road - Six Mile Road	1.8	100%	1.64×10^5	2.13×10^4	13.0%
511	Six Mile Road - Nine Mile Road	0.7	100%	7.84×10^4	2.13×10^4	27.2%
10F	Bolsover Street - Knight Street	1.5	66.7%	1.36×10^6	1.43×10^4	1.0%
10F	Knight Street - Alexandra Street	0.7	33.3%	1.36×10^6	7.03×10^3	0.5%
196	Campbell Street – Queen Elizabeth Drive	1.5	33.3%	9.34×10^5	7.03×10^3	0.8%
194	Elizabeth Drive - Dean Street	1.4	33.3%	6.41×10^5	7.03×10^3	1.1%
194	Dean Street - Thozet Road	1.1	33.3%	3.63×10^5	7.03×10^3	1.9%

A summary of the assessment criteria and payment contributions is detailed below:

Development Starting Year:	2011
Assessment Period:	10 Years
Road Rehabilitation Contribution:	0.81 ¢/tonne
Routine Maintenance Contribution:	2.16 ¢/tonne
Total Contribution:	**2.97 ¢/tonne**

The results from the PIA Spreadsheet (refer Appendix D attached CD) indicates that the proposed Extractive Industry Threshold limit of 100,000 tonne/annum transported on the SCR **will trigger** both Routine Maintenance or Road Rehabilitation Contributions according to the assessment criteria in the GARID.

SCR Traffic Operation Assessment (TOA) – Network Assessment

A *TOA - Network Assessment* is required when operational traffic generated from a proposed development equals or exceeds 5% (trigger volume) of the existing Average Annual Daily Traffic (AADT) volume on the SCR network.

As part of the forecast traffic operations for the proposed development, it is estimated that no more than 36 vehicle trips (refer Development Generated Traffic Volumes above) will be generated from the site per trading day.

The table below compares the AADT volumes with the forecast development generated traffic volumes:

Road Name	Section	2010 AADT	Development Generated Traffic (Veh / day)	% of Background
511	Bruce Highway - Show Grounds	6871	34	0.5%
511	Show Grounds - Western Street	4840	34	0.7%
511	Western Street - Lion Creek Road	3107	34	1.1%
511	Lion Creek Road - Six Mile Road	3107	34	1.1%
511	Six Mile Road - Nine Mile Road	1472	34	**2.3%**
10F	Bolsover Street - Knight Street	32373	34	0.1%
10F	Knight Street - Alexandra Street	32373	34	0.1%
10F	Alexandra Street – Shopping Fair	32373	34	0.1%
10F	Shopping Fair – Richardson Road	15399	34	0.2%
10F	Richardson Road – Farm Street	15399	34	0.2%
196	Campbell Street – Queen Elizabeth Drive	22208	34	0.2%
194	Elizabeth Drive - Dean Street	17148	34	0.2%
194	Dean Street - Thozet Road	8451	34	0.4%

From the DTMR traffic data (refer Appendix C) the above table shows that no sections along the SCR will have development generated traffic greater than 2.3% of the background volume. Therefore, in accordance with the GARID this volume is considered insignificant (defined as expected growth) and as a result further detailed intersection investigation (including SIDRA) is not required. Notwithstanding the above, it will be the intention of this development to limit HV movements during peak hours (ie: 7–9am and 4–6pm) to reduce inner city congestion.

LGR & SCR Traffic Operation Assessment (TOA) – Network Trafficability
The proposed transport route has a number of LGR and SCR intersections/roundabouts with confined geometry which have been assessed by vehicle swept path analysis. Simulations on these confined intersections have been completed for both a 'Truck and Dog trailer' (design vehicle) and '19m Semi Trailer' (check vehicle) configuration. The results are as follows:

Fogarty Road
The proposed transport route will utilize a number of key LGR in both rural and urban areas. To provide access to the processing facility the existing 'unmade' Fogarty Road will require upgrading to a standard suitable for heavy vehicle traffic.

▼ Figure 7: Fogarty Road looking south at 'unmade' section

To achieve the operational access requirements, it is proposed that the following minimum road design elements shall be considered:

- Less than 34 veh/day
- 20.117m Road Reserve (existing Fogarty Road)
- 8m Formation
- 8m Pavement Width
- No Seal (Gravel)
- Minimum 1 on 6 batters
- 40km/hr Desirable Speed Environment (with 60km/hr Design Elements)

Fogarty Road (and the surrounding road network) is subject to significant inundation during moderate flood events; as a result the proposed road formation will be raised by approximately 600mm although it is not the intention of this development to provide a flood immune road access. Table drains will be provided along the road formation to divert overland flow toward to the existing wetland area towards Newman Road.

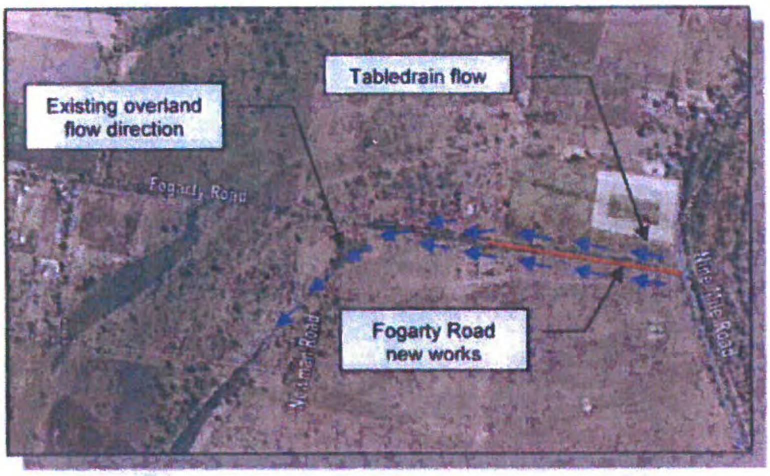
Due to the isolated traffic catchment (road predominately used by this development only), extremely poor subgrade conditions (typically black soil) and the high content of heavy vehicle movements, bituminous surfacing has been omitted in lieu of regular maintenance grading and gravel re-sheeting by the Applicant.

To limit the likelihood of thoroughfare traffic utilizing the new formation to access Fogarty Lane, the development access road will terminate at the intersection of the unnamed road reserve (approximately 540m from the Nine Mile Road and Fogarty

Road intersection. The end of the development access road will have a U-turn provision (unsealed widening) to allow vehicles to return to Nine Mile Road should they inadvertently drive down Fogarty Road. Warning signage will also be placed at the Fogarty Road and Nine Mile Road intersection to caution motorist that this is a 'No Through' Road.

The Applicant wishes to assume responsibility for the maintenance of Fogarty Road (from Nine Mile Road to the Unnamed Road reserve) for the duration of the Extractive Industry operation (on Lot 432 on LIV401245 and Lot 250 on R2621). To further indemnify Council from any potential litigation, the Applicant is prepared to hold a Public Liability insurance policy over this section of Fogarty Road reserve.

▼ Figure 8: Fogarty Road proposed upgrade works



Fogarty Road and Nine Mile Road Intersection

The current Fogarty Road and Nine Mile Road intersection is unformed (refer photos below), however the Nine Mile thru road is bitumen sealed. As part of the development generated vehicle movements (turning east) this intersection will require upgrding to a minimum standard of unsealed Basic Left-turn (BAL) which will provide a deceleration taper from Nine Mile Road into Fogarty Road. This BAL should also provide adequate turning radius in accordance with Road Planning and Design Manual (RPDM) Figure 13.79: 'Basic Left-turn Treatment (BAL) on Rural Roads where the side road AADT is less than 50'.

Figure 10: ▶
Fogarty Road and Nine Mile Road intersection looking west

◀ Figure 9:
Fogarty Road and Nine Mile Road intersection looking east

Nine Mile Road

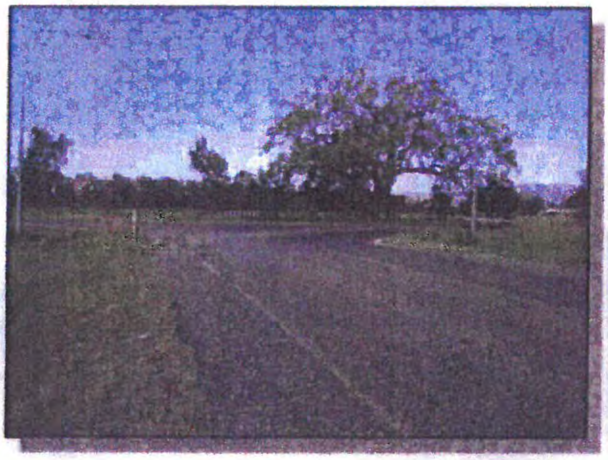
The section of Nine Mile Road leading back to Ridgelands Road has a 7.0m wide bitumen seal with sealed shoulders varying between 0.0m to 0.5m. The horizontal geometry is flat with a number of floodway and creek crossings, while the vertical geometry is moderately winding with large sweeping bends.

◄ Figure 11:
Nine Mile Road looking south

Figure 12: ►
Nine Mile Road looking north

Nine Mile Road and Ridgelands Road

The Nine Mile Road and Ridgelands Road intersection was upgraded in 1999 – 2000 to an Auxiliary Right-turn (AUR) configuration. In addition, the turn movements into Nine Mile Road have a 50m deceleration lane (from the east) and a 35m acceleration lane (to the west).



◄ Figure 13:
Nine Mile Road and Ridgelands Road intersection looking north

Figure 14: ►
Nine Mile Road and Ridgelands Road intersection looking east showing AUR lane

Ridgelands Road and Lion Creek Road

The Ridgelands Road and Lion Creek Road intersection consists of an offset Tee configuration controlled by a give-way sign from Lion Creek Road. This section of the Ridgelands Road was recently upgraded by Rockhampton Regional Council in 2009-2010 to include a 1.0m sealed shoulder and full width slurry seal. No modifications were done to the existing intersection treatment.

◄ Figure 15:
Ridgelands Road and Lion Creek Road intersection looking east

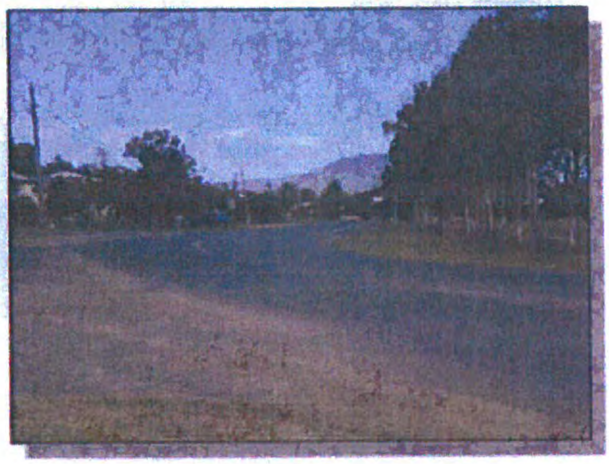


Figure 16: ►
Lion Creek Road looking north-east from intersection

Lion Creek Road

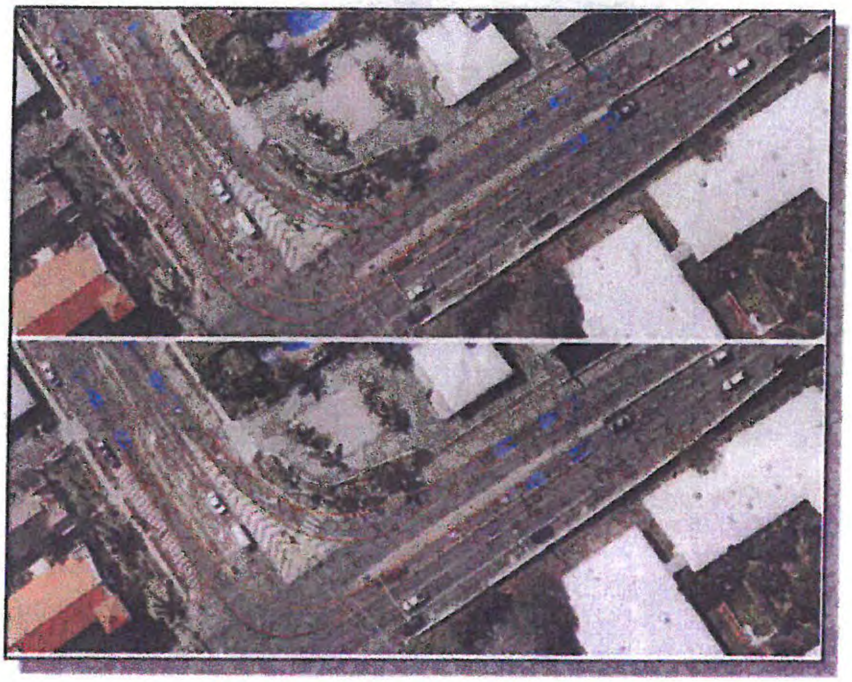
Lion Creek Road consists of 2 x 3.5m traffic lanes with sealed shoulders varying between 1.0m to 3.5m and very wide verges. The road alignment is flat with wide sweeping bends and traverses a mix of residential, commercial, and sporting zones. It is also noted that Pink Lilly Sands currently carts quarry materials along this road.

◄ Figure 17:
Lion Creek Road looking west showing wide verges

Figure 18: ►
Lion Creek Road looking east showing flat terrain

Bolsover Street and Bruce Highway Intersection

This signalized intersection has raised concrete central medians with a 'free' left-turn CHL (with acceleration lane) from Bolsover Street onto the Bruce Highway. Vehicles turning right from the Bruce Highway are services by a signalized CHR. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.



◄ Figure 19: Bolsover Street and Bruce Highway intersection HV swept paths
Top: Truck and Dog Trailer,
Bottom: Semi Trailer

Bruce Highway and Knight Street

The Bruce Highway and Knight Street intersection is a 4-way signalized intersection with raised concrete central medians. There is a 'free' left-turn lane (High entry angle CHL) into Knight Street from the Bruce Highway (northbound). Vehicles turning right from Knight Street are serviced by a signalized CHR.

Knight Street is approximately 12.0m wide and bounded by mountable kerb and channel on both sides. Within the proposed transport route along Knight Street, the abutting area is commercial and industrial only. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.

◄ Figure 20: Bruce Highway and Knight Street intersection looking south-east

Figure 21: ► Knight Street looking north-west showing existing commercial and industrial development

▲ Figure 22:
Bruce Highway and Knight Street intersection HV swept paths
Left: Truck and Dog Trailer, Right: Semi Trailer

Bruce Highway and Musgrave Street Intersection

The Bruce Highway and Musgrave Street Intersection is a major junction between the Fitzroy River Bridge and Neville Hewitt Bridge road corridors. The intersection is signal controlled and has a dual lane 'high entry angle' left-turn (CHL) for north-bound movements. Vehicles turning right from the Bruce Highway are serviced by a dual signalized CHR. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.

▲ Figure 23:
Bruce Highway and Musgrave Street intersection HV swept paths
Left: Truck and Dog Trailer, Right: Semi Trailer

Bruce Highway and Farm Street

The Bruce Highway and Farm Street intersection has a 4-way signal controlled configuration with raised central concrete medians. A 'free' left-turn (CHL) exists for movement off the Bruce Highway into Farm Street. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.

Farm Street provides 2 x 3.5m traffic lanes with 2.5m parking bays on both sides. The road abuts both residential and schools zones and is the major connector between the suburb of Kawana and the Bruce Highway. As shown on the propose transport route, vehicle movements along this section will only be in the west-bound direction

◄ Figure 24:
Farm Street looking east at pedestrian crossing facility opposite Glenmore Primary School

Figure 25: ►
Bruce Highway and Farm Street intersection looking south showing free CHL into Farm Street

▲ Figure 26:
Bruce Highway and Farm Street intersection HV swept paths
Left: Truck and Dog Trailer, Right: Semi Trailer

Farm Street and McLaughlin Street

This intersection consists of a basic 4-way signalized treatment with a right-turn (CHR) from Farm Street into McLaughlin Street. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.

Access along McLaughlin Street passes through industrial, commercial, sporting and school zones. Towards the Farm Street intersection the road is abutted by a one-way service road for Glenmore Primary School as well as on-street parking bays on the opposite side. Traffic lanes along this section vary between 3.0m – 3.5m.

◄ Figure 27:
McLaughlin Street looking north at pedestrian crossing facility opposite Glenmore State Primary School

Figure 28: ►
Farm Street and McLaughlin Street intersection looking south at service road

▲ Figure 29:
Farm Street and McLaughlin Street intersection HV swept paths
Left: Truck and Dog Trailer, Right: Semi Trailer

Carlton Street and Bruce Highway

The Carlton Street and Bruce Highway intersection is a 4-way signalized configuration with raised concrete central medians. Left-turn movements from Carlton Street onto the Bruce Highway are catered for by a signalized CHR. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.

Carlton Street consists of 2 x 3.5m traffic lanes with sealed shoulders / parking bays varying between 0.0m to 2.5m. The road alignment is hilly and traverses a mix of residential, commercial, and school zones. It is also noted that Holcim (Australia) Pre-Cast Plant, currently carts products along this road.

◄ Figure 30:
Carlton Street looking west showing wide traffic width

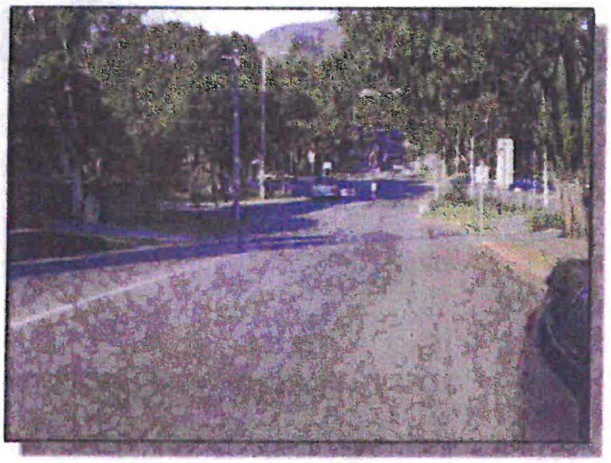
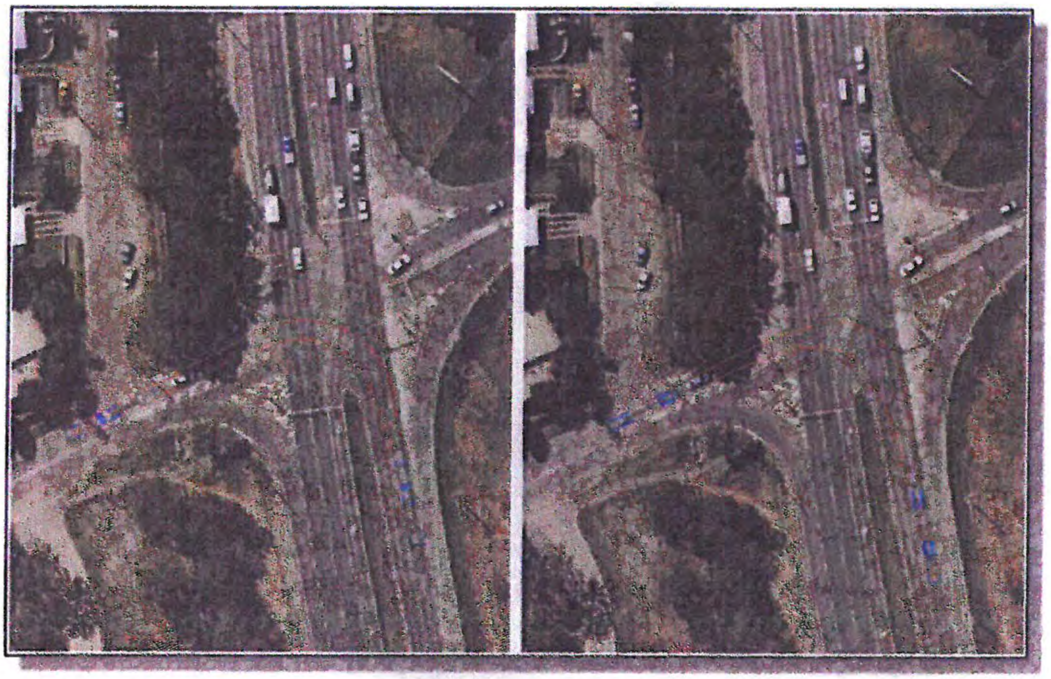


Figure 31: ►
McLaughlin Street and Bruce Highway intersection looking east

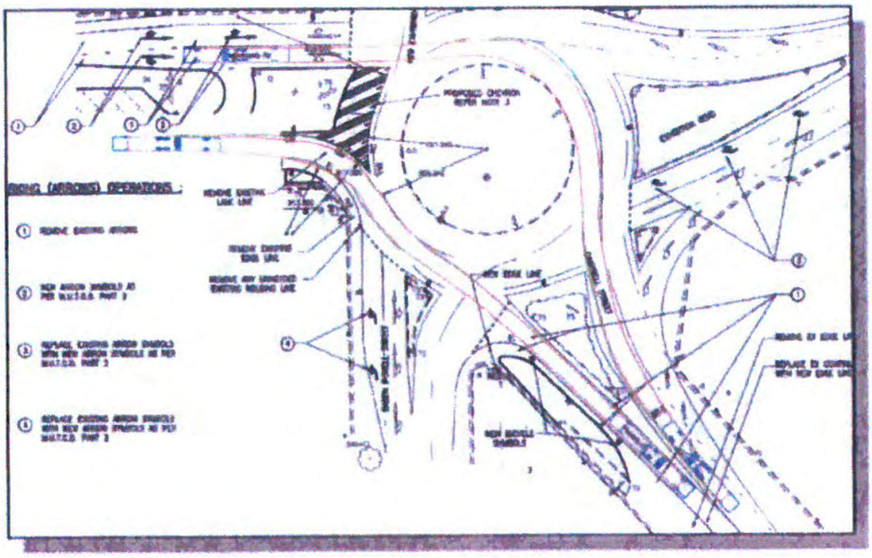


▲ Figure 32:
Carlton Street and Bruce Highway intersection HV swept paths
Left: Truck and Dog Trailer, Right: Semi Trailer

Ridgelands Road and Campbell Street

The intersection consists of a 5-way roundabout configuration with single/dual circulating lane/s. Although both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection, constriction exist on other intersections along this proposed transport route.

Ridgelands Road consists of 2 x 3.5m traffic lanes with sealed shoulders / parking bays varying between 0.0m to 2.5m. The road alignment is flat and traverses a mix of rural, residential and commercial zones. It is also noted that Pink Lilly Sands currently carts quarry materials along this road.



▲ Figure 33:
Ridgelands Road and Campbell Street intersection HV swept paths
Truck and Dog Trailer only

Campbell Street and Archer Street

The Campbell Street and Archer Street intersection has a roundabout configuration with single circulating lane. Although both Truck & Dog trailer and Semi trailer HV movements are catered for at this roundabout, constriction exist on other intersections along this proposed transport route.

◄ **Figure 34**:
Campbell Street and Archer Street intersection HV swept paths
Truck and Dog Trailer only

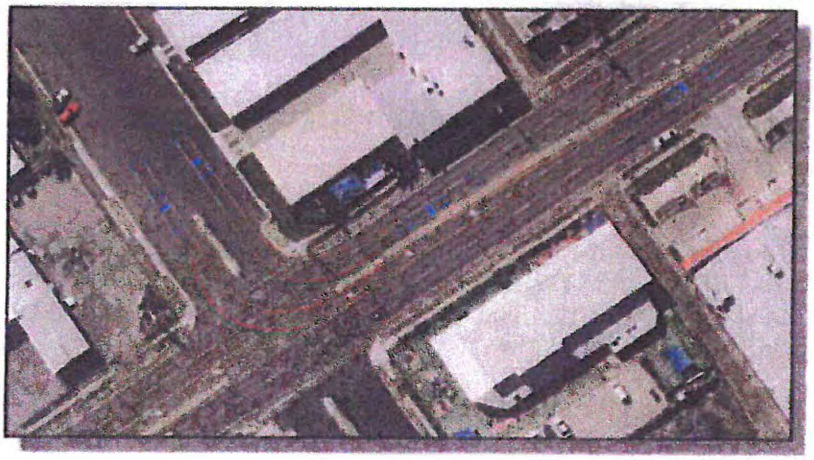
Campbell Street and Fitzroy Street

The Campbell Street and Fitzroy Street intersection has a 4-way signalized configuration with raised concrete central medians on the SCR. It is noted that Semi trailers **cannot** legally turn left from the Campbell Street AUL onto Fitzroy Street without encroaching over adjacent traffic lanes. Vehicles turning right from Fitzroy Street are services by a signalized CHR.

Campbell consists of 2 x 3.5m traffic lanes with sealed shoulders / parking bays varying between 2.5m to 3.0m and very wide verges. The road alignment is flat and traverses a mix of residential and commercial zones. It is also noted that Pink Lilly Sands currently carts quarry materials along this road.

◄ Figure 35:
Campbell Street looking west showing wide verges

Figure 36: ►
Campbell Street looking west showing flat terrain



▲ Figure 37:
Campbell Street and Fitzroy Street intersection HV swept paths
Truck and Dog Trailer only

Fitzroy Street, Queen Elizabeth Drive and Lakes Creek Road

This intersection is a 4-way signalized configuration with raised concrete central medians. Right-turn movements from Queen Elizabeth Drive onto Lakes Creek Road are catered for by dual signalized CHR. Vehicles turning left from Lakes Creek Road onto the Fitzroy River Bridge are services by dual signalized 'high entry angle' CHL.

Fitzroy Street / Queen Elizabeth Drive traffic lanes vary between 4 x 3.0m undivided lanes (on the Fitzroy River Bridge) and 4 x 3.5m divided lanes (through the Central Business District - CBD). The road traverses the heart of the CBD which is a mix of retail, commercial and entertainment zones. It is also noted that a high proportion of HV (including quarry and cattle transport companies) cart materials along this road.

▲ Figure 38:
Fitzroy Street and Lakes Creek Road intersection HV swept paths
Truck and Dog Trailer only

Lakes Creek Road and Thozet Road Intersection

The Lakes Creek Road and Thozet Road intersection is a signalized Tee configuration with a left-turn AUL. Right-turn movements from Thozet Road are catered for by signalized right-turn lane.

Lakes Creek Road traffic lanes are 2 x 3.5m wide with sealed shoulders between 2.0m and 2.5m. The road traverses a mix of residential and commercial zones with some areas accessed by service roads. It is also noted that a high proportion of HV (including quarry and cattle transport companies) cart materials along this road.

▲ Figure 39:
Lakes Creek Road and Thozet Road intersection HV swept paths
Truck and Dog Trailer only

Conclusion and Recommendation

An assessment of the pavement and operational traffic impacts of a proposed sand quarry on Fogarty Road, Fairy Bower has been completed. A summary of the findings is provided below:

- Truck & Dog trailer and/or Semi trailer vehicles will be used to cart the material to the (proposed) 3 major suppliers.
- Utilization of both LGR and SCR will be required for the delivery of the quarry materials.
- It is anticipated that the proposed development will generate no more than 34 daily vehicle movements each working day.
- Proposed transport movements shall be scheduled for non-peak periods to reduce LGR and SCR congestion.
- In accordance with the DTMR GARID the proposed development will trigger pavement impact contributions of 2.97 ¢/tonne for SCR.
- The anticipated traffic operations volumes are less than 5% of the background traffic volume which is considered as expected growth, thus not requiring a detailed intersection analysis on SCR.
- Fogarty Road will be upgraded to a rural road standard (without seal) and shall remain the liability and responsibility of the Applicant for the duration of the development period.
- Fogarty Road and Nine Mile Road intersection shall be upgraded to an unsealed BAL with adequate turning radius to accommodate the proposed design vehicle.
- In accordance with the proposed transport route, all intersections and roads can cater for the turning requirements of the design vehicle, however only Site 1 and 3 can cater for Semi trailer deliveries.

In accordance with the findings above, it is the recommendation of McMurtrie Consulting Engineers that the proposed sand quarry MCU application be approved subject to the abovementioned findings being addressed prior to commencement.

Yours Faithfully,

Ian McMurtrie (RPEQ: 1347)
(Director)

Copy: Rockhampton Regional Council
P.O. Box 1860
Rockhampton
Attn: The Assessment Manager

Reference Material

- Department of Transport and Main Roads – Road Planning and Design Manual
- Department of Transport and Main Roads – Guidelines for Assessment of Road Impacts of Developments
- Department of Transport and Main Roads – Pavement Impact Assessment Spreadsheet
- Department of Transport and Main Roads – Low Level Aerial Photography
- Department of Transport and Main Roads – Intersection Plans
- Rockhampton Regional Council – Capricorn Municipal Development Guidelines
- Tapsell Consulting Engineers – Proposed Site Development Layout
- Schlencker Surveying – Detail and Level Survey Plan
- Where is.com - Sensis Maps

APPENDIX A

(i) Electronic Mail from Mr Bruce Russell RRC

(ii) Letter dated 9th September 2010 to RRC – Reccommended

Peter Ung

From:	Bruce Russell <Bruce.Russell@rrc.qld.gov.au>
Sent:	Tuesday, 7 September 2010 6:37 PM
To:	Peter Ung
Subject:	RE: DRAFT copy of Foxlee Info Request
Attachments:	image001.jpg

Hello Peter,

An IR was not sent for the Foxlee proposal. We decided we could condition it on the information provided in the application. True, the biggest unknown is the amount of truck movements per day (or per week) and then how does that relate to the existing traffic volumes. Off the top of my head, the biggest issues for Council are:

* effect of turning movements of trucks on pavement life as well as on existing traffic flows (the effect at the Ridgeland Road intersection is likely to be more pronounced than at the site entrance to Nine Mile Road);
* use of Nine Mile Road - which direction - to Gracemere or to Rockhampton?
* use of the road reserve as a private access (will it cause a further extension of Fogarty Lane and necessitate construction from the southern end?)
* maintenance of the "private road" - who does it? (It can create long term issues when the public start using it for access to other lots and then insist on certain access standards);
* estimate of traffic movements, including highs and lows - hard to predict, I know, but..
* I did advise Paul - best to concentrate on traffic to Rockhampton as unlikely much will go via Nine Mile Road to Gracemere - can allow vary approval later rather than try to cover all cases

Best to provide as much information as possible first up.

Give me a call if you want any further discussion.

Regards,

Bruce Russell |Senior Infrastructure Planning Engineer| Rockhampton Regional Council (Dooley Street Office)
Ph: 07 49368611 | Fax: 1300 22 55 79 | E-mail: bruce.russell@rrc.qld.gov.au <mailto:bruce.russell@rrc.qld.gov.au>
Address: PO Box 1860, Rockhampton Q 4700 |Web: www.rockhamptonregion.qld.gov.au

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From: Peter Ung [mailto:peter@mcmengineers.com]
Sent: Monday, 6 September 2010 2:57 PM
To: Bruce Russell
Subject: DRAFT copy of Foxlee Info Request

Hi Bruce,

Would you be able to send me a DRAFT copy of the Foxlee Info Request. It will only be used to assist me in preparing a Fee Offer for Paul Waardyk. Paul has asked me for a quote to address all traffic engineering requirements (Council and DTMR) for the proposed sand quarry project. Thanks.

Regards

Peter Ung

For McMurtrie Consulting Engineers

63 Charles Street North Rockhampton Qld 4701

PO Box 2149 Wandal Qld 4700

Ph. (07) 4921 1780

Fax. (07) 4921 1790

E. mail@mcmengineers.com <mailto:mail@mcmengineers.com>

CIVIL, STRUCTURAL, PROJECT MANAGEMENT & ENVIRONMENTAL

McMurtrie
consulting engineers

63 Charles Street
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Wandal Qld 4700

Phone 07 4921 1780
Fax 07 4921 1790
Mobile 0407 631 066
Email mail@mcmengineers.com

ABN 69 858 286 371

9 September 2010

Our Ref: 026-10-11

Infrastructure Planning
Rockhampton Regional Council
PO Box 1860
Rockhampton QLD 4700

Att: Mr Bruce Russell
Re: Suggested Road Upgrade Standard for Proposed Extractive Industry Material Change of Use (MCU) for Sand Quarry on Lot 432 on LIV401245 at Fogarty Road, Fairy Bower

Dear Mr Russell,

McMurtrie Consulting Engineers have been engaged by Mr Paul Waardyk (the Applicant) to prepare a suggested road upgrade standard of Fogarty Road to service the operational purposes of a proposed MCU for extractive industry, namely a sand quarry. It is envisaged that this document will be utilized as the basis for discussion between the Applicant and Rockhampton Regional Council (RRC) to negotiate an acceptable standard for operational access without upgrading the existing unformed road to the full CMDG Rural Road standards.

This proposed MCU is part of a joint venture arrangement (under separate MCU Applications) with an adjoining land owner (John Foxlee) to extract, process and dispatch sand from the subject site to customers in and around the Rockhampton area via the Nine Mile Road and Ridgelands Road network.

The intent of the joint venture is to establish a processing plant on Lot 432 on LIV401245 (owned by Mr Waardyk) and extract the sand from the 2 sites in 2 stages. Stage 1 will involve sourcing sand from Lot 250 on R2621 (owned by Mr Foxlee) and transporting it across Fogarty Road (along the Unnamed Road reserve between Lot 432 on LIV401245 and 257 on LN882) to the processing plant. Once the material source is depleted on Lot 250 on R2621 the extractive industry (Stage 2) will commence on Lot 432 on LIV401245. The screening plant will remain on Lot 432 on LIV401245 for the duration of the extractive industry permit.

It is envisaged that all traffic ingress and egress to the site/s (Lot 432 on LIV401245 and Lot 250 on R2621) will be via the Fogarty Road reserve off Nine Mile Road. At present the Fogarty Road frontage to these allotments is unformed; although there is evidence of infrequent use of the existing 'unmade road' by local residents as a 'dry weather / all-terrain vehicle' short-cut.

As part of the extraction and processing operation in Stage 1, articulated trucks will be utilised to cart sand from Lot 250 on R2621 to Lot 432 on LIV401245, crossing Fogarty Road at the Unnamed Road intersection. Once screened, the sand will be stockpiled onsite and transported by Truck & Dogs to various sites as demand dictates.

The CMDG Rural Design Criteria - Table D1.21.01 details a Rural Access as:

- Less than 100 veh/day
- 25m Road Reserve
- 8m Formation
- 5.5m Pavement Width
- 4.0m Seal Width
- 100km/hr Desirable Speed Environment (with 80km/hr Design Elements)

To achieve the operational access requirements, it is proposed that the following minimum road design elements shall be considered:

- Less than 30 veh/day
- 20.117m Road Reserve (existing Fogarty Road)
- 8m Formation
- 8m Pavement Width
- 0.0m Seal Width
- 60km/hr Desirable Speed Environment (with 60km/hr Design Elements)

Fogarty Road (and the surrounding road network) is subject to significant inundation during moderate flood events; as a result it is not the intention of this development to provide a flood immune road access. Cross drainage structures will be sized and placed as low-flow devices and to provide flood water equalisation through the road embankment.

Due to the isolated traffic catchment (road predominately used by this development only), extremely poor subgrade conditions (typically black soil) and the high content of heavy vehicle movements, the bituminous surfacing has been omitted in lieu of regular maintenance grading and gravel re-sheeting.

The Applicant wishes to assume responsibility for the maintenance of Fogarty Road (from Nine Mile Road to the Unnamed Road reserve) for the duration of the Extractive Industry operation (on Lot 432 on LIV401245 and Lot 250 on R2621). To further indemnify Council from any potential litigation, the Applicant is prepared to hold a Public Liability insurance policy over this section of Fogarty Road reserve.

To offset some of the capital contribution (ie: road construction costs) provided for by this proposed development, the Applicant wishes to request the Council supply of suitable pavement materials in accordance with RRC Policy No. POL.I1.5 – Opening of Unconstructed Roads and Procedure No. PRO.I1.5 - Opening of Unconstructed Roads.

I hope this 'suggest road upgrade' strategy meets with Council's approval and I look forward to discussing the project in further detail at our meeting scheduled for 4:00pm 09 September 2010 at the McMurtrie Consulting Engineers Office.

Should you have any questions in the meantime please do not hesitate to call me on (07) 49 211 780.

Yours Faithfully,

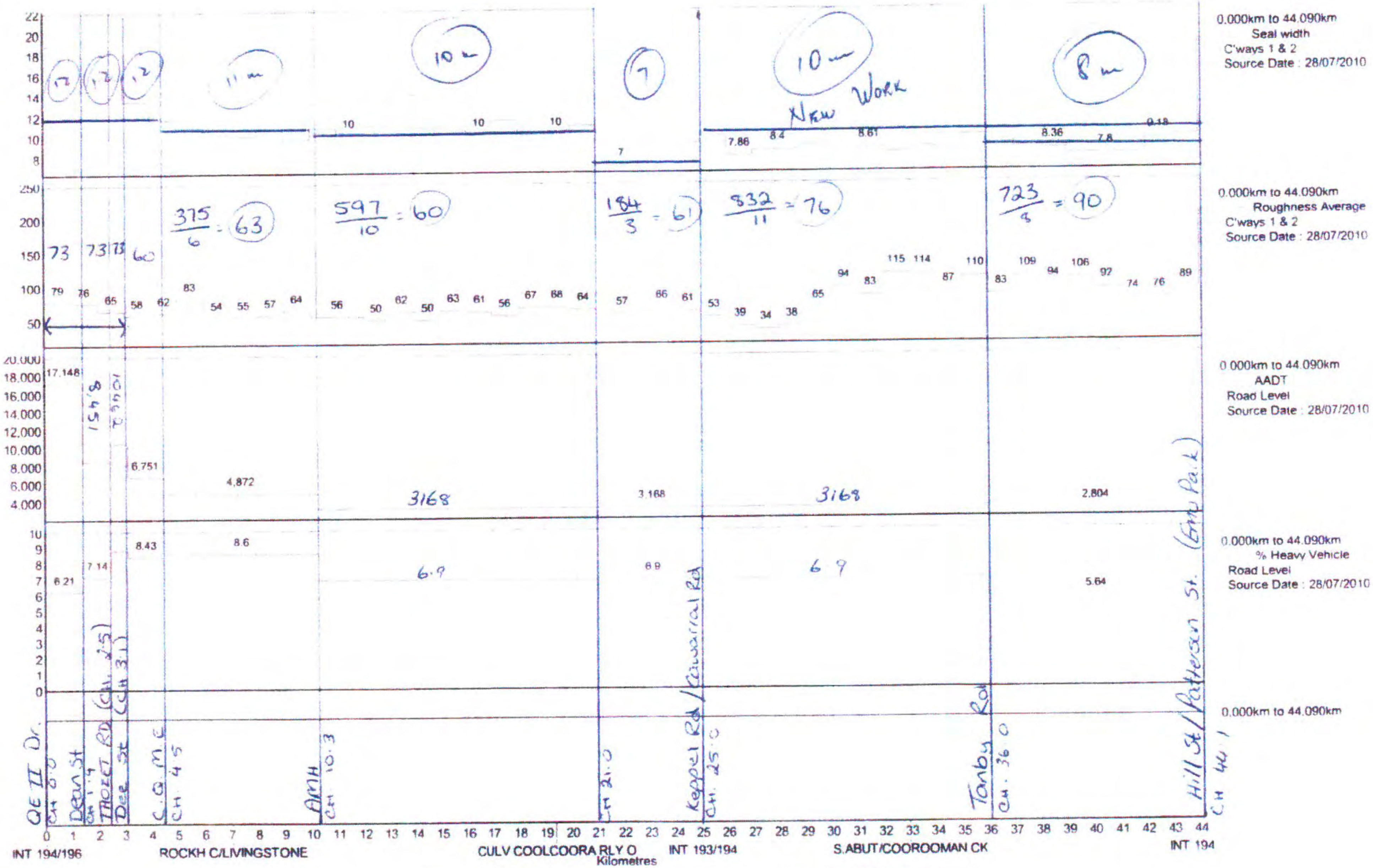
PUng

Peter Ung
For McMurtrie Consulting Engineers

APPENDIX B
DTMR Pavement and Road Data

Queensland Government

Road Section 194 - ROCKH... IPTON - EMU PARK ROAD (44.1 ...) from Roadlink refreshed on 29 Jul 2010

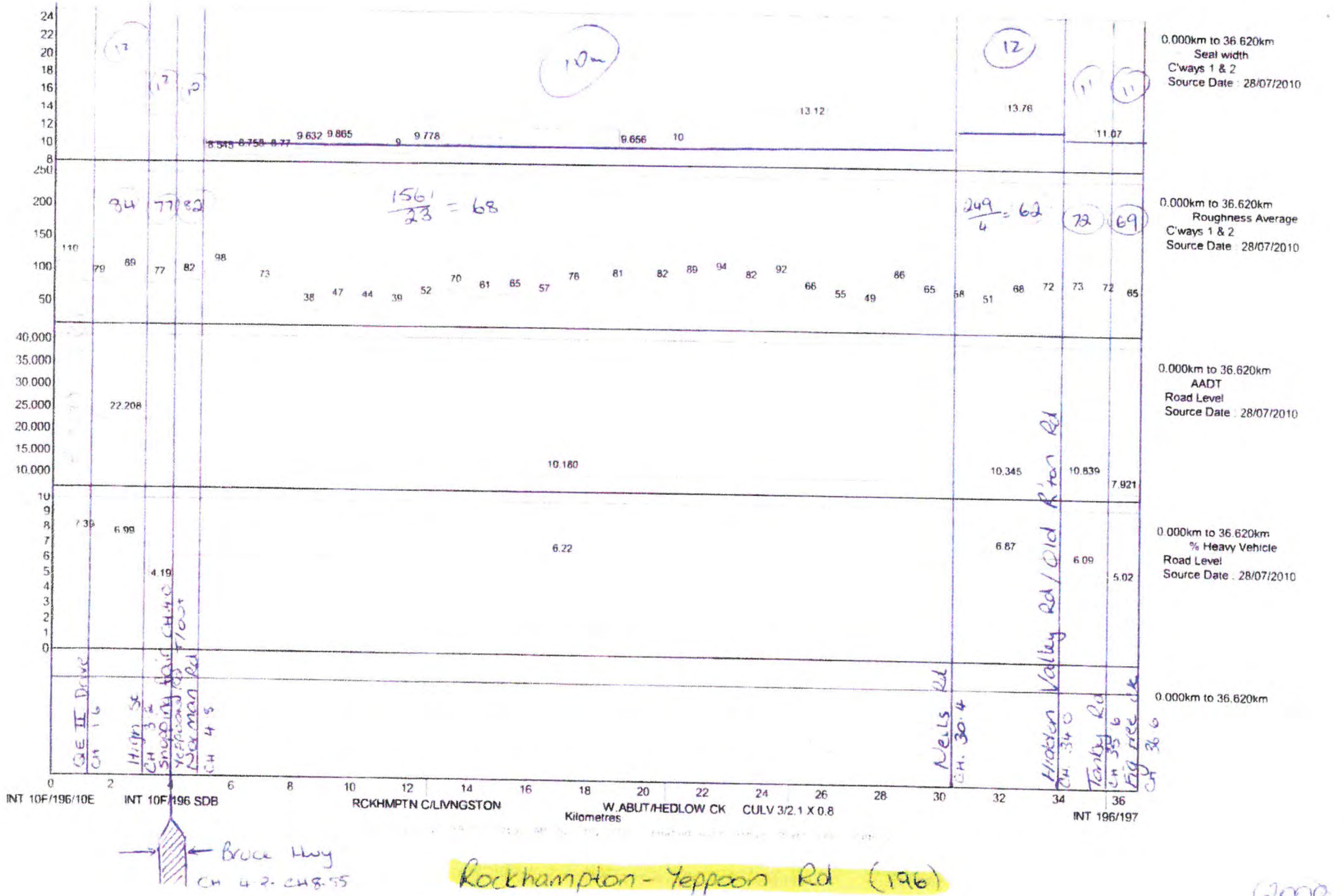


Rockhampton - Emu Park Rd (194)

2009

Queensland Government

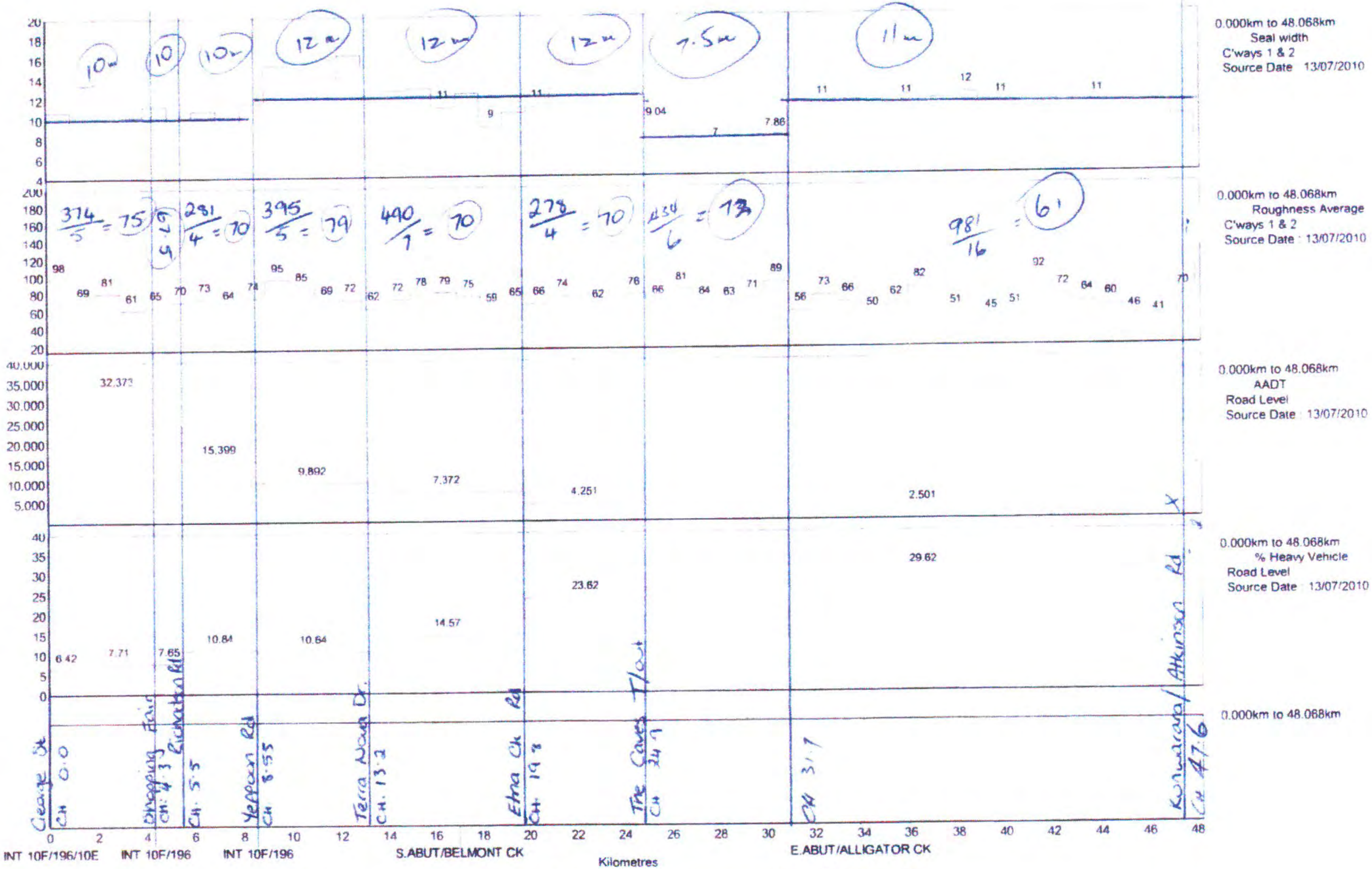
Road Section 196 - RC KH MPTON - YEPPOON ROAD (3) from Roadlink refreshed on 29 Jul 2010



Rockhampton - Yeppoon Rd (196)

(2009

Queensland Government Road Section 10F - BRUCE HIGHWAY (ROCKHAMPTON-ST LAWRENCE) , 77.9 km) from Roadlink refreshed on 14 Jul 2010



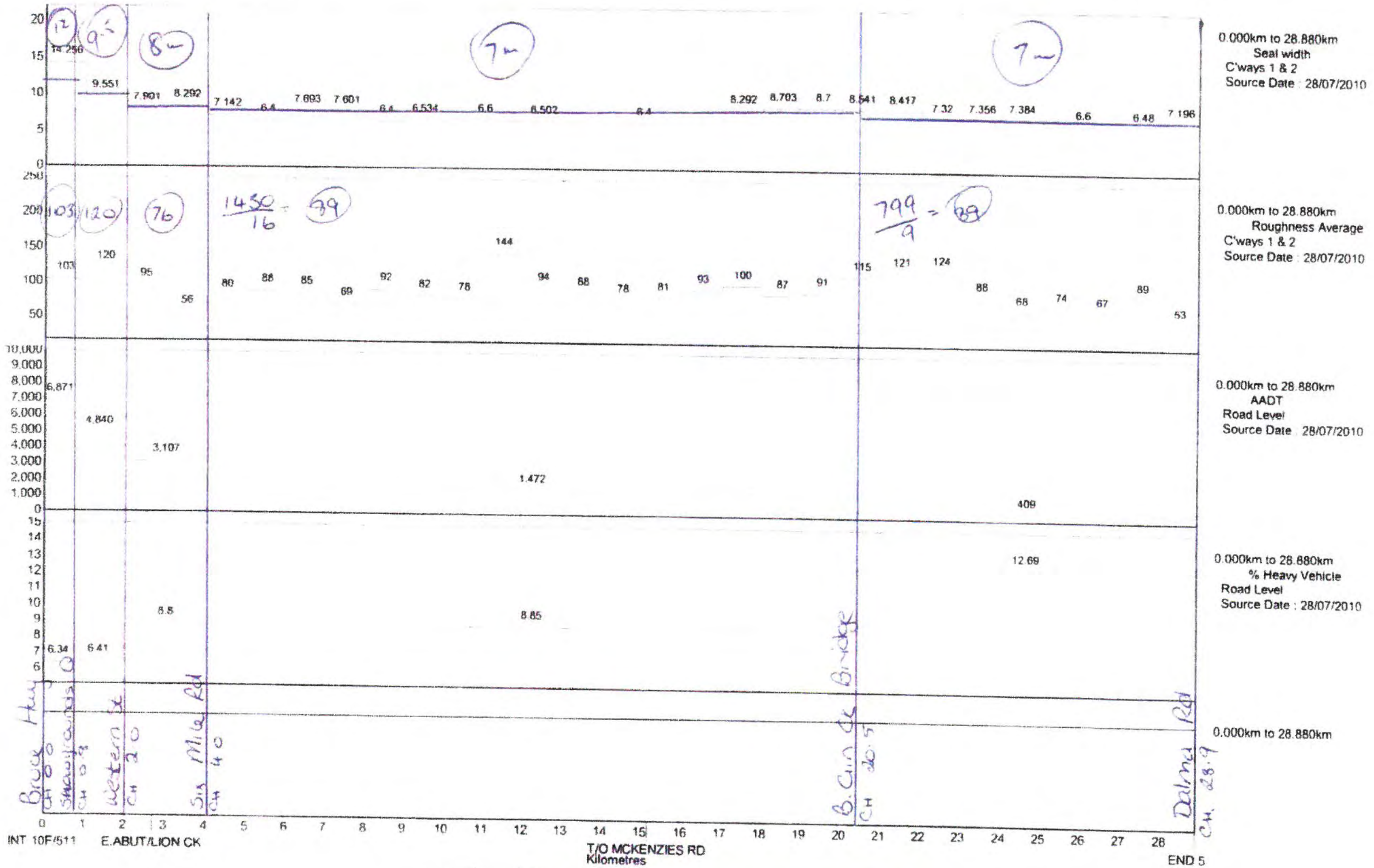
Bruce Hwy (10F)

(1)

2009

Queensland Government

Road Section 511 - ROCKHAMPTON - RIDGELANDS ROAD (28.9 km) from Roadlink refreshed on 29 Jul 2010



Ridgelands Road (511)

2009

APPENDIX C
Pavement Impact Assessment Spreadsheet Results

Proposed Sand Quarry MCU, Fairy Bower

Developer Contribution Summary

Sect No.	Road No.	Road Name	Road Sections	Lgth (km)	Reduced Pvt Life To	Reduced Pvt Life From	Dev. Contribution (@ the PV Base Yr.) Rehab ($) To	Rehab ($) From	Mtce ($) To	Mtce ($) From	Total ($)
1	511	R'ton - Ridge	Bruce - Show Grd		0.1%	1.2%				$0	$0
2		R'ton - Ridge	Show Grd - Western St		0.1%	1.1%				$0	$0
3		R'ton - Ridge	Western St - Lion Ck Rd		0.1%	1.4%				$0	$0
4		R'ton - Ridge	Lion Ck Rd - Six Mile Rd	1.84	0.3%	4.3%				$12,550	$12,550
5		R'ton - Ridge	Six Mile Rd - Nine Mile Rd	0.715	0.7%	10.5%		$8,129		$9,043	$17,172
6											
7	10F	Bruce Hwy	Bolsolver St - Knight St		0.0%	0.4%				$0	$0
8		Bruce Hwy	Knight St - Alexandra St		0.0%	0.2%				$0	$0
9		Bruce Hwy	Alexandra St - Shopping Fair		0.0%	0.2%				$0	$0
10			Shopping Fair - Richardson Rd		0.0%	0.4%				$0	$0
11			Richardson Rd - Farm St		0.0%	0.3%				$0	$0
12											
13											
14											
15											
16	196	R'ton - Yepp	Campbell St - QEII Drv		0.0%	0.3%				$0	$0
17											
18	194	R'ton - Emu Pk	QEII Drv - Dean St		0.0%	0.4%				$0	$0
19		R'ton - Emu Pk	Dean St - Thozet Rd		0.0%	0.6%				$0	$0
20											
21											
22											
23											
24											
25											
26											
[illegible]											
[illegible]											
29											
30											
			Totals [1] =	2.6			$0	$8,129	$0	$21,593	$29,722

Start of Development Traffic = 2011

Development Duration 10 years

ESA Increase Trigger = 5.0%

Total Tonnage = 1,000,000 tonnes

Developer Contribution expressed as a Cost per Tonne (@ the PV Base Yr.)

cents / tonne = 2.97

cents / tonne / km = 1.16

Protection Passord for all worksheets = mrd

[1] Includes only road sections that are subject to Development Generated Traffic > 5%

Increase Trigger = 5.0%

Routine Mtce Contribution Calculation

Sect. No.	Link Data: Road No.	Road Name	Length (km)	Mtce Costs at PV Base Year (2011): ESA's/lane per Year	Routine Mtce $/lane-km/yr	Unit Cost $/ESA/km/yr
1	511	Bruce - Show Grd	0.8	2.62E+05	$9,241	$0.0353
2		Show Grd - Western St	1.2	1.87E+05	$7,603	$0.0407
3		Western St - Lion Ck Rd	0.16	1.64E+05	$6,751	$0.0410
4		Lion Ck Rd - Six Mile Rd	1.84	1.64E+05	$6,751	$0.0410
5		Six Mile Rd - Nine Mile Rd	0.715	7.84E+04	$5,964	$0.0761
6						
7	10F	Bolsolver St - Knight St	1.462	1.36E+06	$7,996	$0.0059
8		Knight St - Alexandra St	0.6707	1.36E+06	$7,996	$0.0059
9		Alexandra St - Shopping Fair	0.8	1.36E+06	$7,996	$0.0059
10		Shopping Fair - Richardson Rd	1.2	6.42E+05	$7,996	$0.0125
11		Richardson Rd - Farm St	0.7	9.10E+05	$7,996	$0.0088
12						
13						
14						
15						
16	196	Campbell St - QEII Drv	1.481	9.34E+05	$9,241	$0.0099
17						
18	194	QEII Drv - Dean St	1.4	6.41E+05	$9,241	$0.0144
19		Dean St - Thozet Rd	1.1	3.63E+05	$9,241	$0.0255
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
		Total =	13.5			

Sect. No.	TOWARDS Development - PV of Increases in Mtce Costs (year by year) 1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	Discount Rate = 6.0% 9 2019	10 2020	PV Total
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
											$0

Sect. No.	FROM Development - PV of Increases in Mtce Costs (year by year) 1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	Discount Rate = 6.0% 9 2019	10 2020	PV Total
1											
2											
3											
4											$0
5											$0
6											$0
7	$1,609	$1,518	$1,432	$1,351	$1,274	$1,202	$1,134	$1,070	$1,009	$952	$12,550
8	$1,159	$1,094	$1,032	$973	$918	$866	$817	$771	$727	$686	$9,043
9											
10											$0
11											$0
12											$0
13											$0
14											$0
15											
16											
17											
18											
19											$0
20											
21											$0
22											$0
23											
24											
25											
26											
27											
28											
29											
30											
											$21,593

Rehabilitation Contribution Calculation

Rehab Design Life = 20

Towards Development: Discount Rate = 6.0%. From Development: Discount Rate = 6.0%.

Sect No.	Road No.	Road Name	Road Sections	Length (km)	Rehab. Year WITHOUT Dev Traffic. Based on 2010 Roughness Data: Exist. Roughness (1)	Roughness at fail (2)	Years to failure (3)	Rehab. Yr. (Rough) (4)	Rehab. Year for Contrib Calc (5)	PVT. Life WITHOUT Dev. Traffic (Dev. Start to Rehab. Year): Years to Rehab. From Dev Start (6)	ESA's/yr at Dev Start (2011) (7)	Cumul.B'gr ESA (Dev Start to Rehab) (8)	Towards Development – Reduced PVT. Life WITH Dev. Traffic (Dev. Start to Rehab. Year): Cumul. Dev Traffic (9)	Reduced B'ground ESA's to Rehab (10)	Years to Rehab (with Dev) (11)	Reduced Pvt. Life (years) (12)	PV - Rehab.: Bring Forward Factor (13)	Dev. Contrib. (14)	From Development – Reduced PVT. Life WITH Dev. Traffic (Dev. Start to Rehab. Year): Cumul. Dev Traffic (15)	Reduced B'ground ESA's to Rehab (16)	Reduced years to Rehab. (17)	Reduced Pvt. Life (years) (18)	PV - Rehab.: Bring Forward factor (19)	Dev. Contrib. (20)
1	511	R'ton - Ridge	Bruce - Show Grd	0.8	103	120	5.7	2016	2016	4.7	2.62E+05	1.33E+06	4,950	1325709	4.7	0.02	0.0007	$147	70,290	1.26E+06	4.4	0.23	0.0103	$2,112
2		R'ton - Ridge	Show Grd - Western St	1.2	120	120	0.0	2010	2030	19.0	1.87E+05	4.83E+06	4,950	4.82E+06	19.0	0.01	0.0003	$70	70,290	4.76E+06	18.8	0.21	0.0041	$1,003
3		R'ton - Ridge	Western St - Lion Ck Rd	0.16	76	120	14.7	2025	2025	13.7	1.64E+05	2.81E+06	4,950	2.81E+06	13.6	0.02	0.0005	$14	70,290	2.74E+06	13.4	0.28	0.0075	$204
4		R'ton - Ridge	Lion Ck Rd - Six Mile Rd	1.84	76	120	14.7	2025	2025	13.7	1.64E+05	2.81E+06	15,000	2.80E+06	13.6	0.06	0.0016	$496	213,000	2.60E+06	12.6	0.86	0.0233	$7,292
5		R'ton - Ridge	Six Mile Rd - Nine Mile Rd	0.715	89	120	10.3	2020	2020	9.3	7.84E+04	8.55E+05	15,000	8.40E+05	9.2	0.14	0.0049	$525	213,000	6.42E+05	7.2	2.10	0.0754	$8,129
6																								
7	10F	Bruce Hwy	Bolsolver St - Knight St	1.462	75	110	11.7	2022	2022	10.7	1.36E+06	1.73E+07	10,050	1.73E+07	10.7	0.01	0.0002	$52	142,710	1.72E+07	10.6	0.08	0.0024	$737
8		Bruce Hwy	Knight St - Alexandra St	0.6707	75	110	11.7	2022	2022	10.7	1.36E+06	1.73E+07	4,950	1.73E+07	10.7	0.00	0.0001	$12	70,290	1.72E+07	10.6	0.04	0.0012	$186
9		Bruce Hwy	Alexandra St - Shopping Fair	0.8	75	110	11.7	2022	2022	10.7	1.36E+06	1.73E+07	4,950	1.73E+07	10.7	0.00	0.0001	$14	70,290	1.72E+07	10.6	0.04	0.0012	$198
10			Shopping Fair - Richardson Rd	1.2	68	110	14.0	2024	2024	13.0	6.42E+05	1.03E+07	4,950	1.03E+07	13.0	0.01	0.0001	$36	70,290	1.03E+07	12.9	0.07	0.0020	$515
11			Richardson Rd - Farm St	0.7	70	110	13.3	2023	2023	12.3	9.10E+05	1.37E+07	4,950	1.37E+07	12.3	0.00	0.0001	$16	70,290	1.37E+07	12.3	0.05	0.0015	$224
12																								
13																								
14																								
15																								
16	196	R'ton - Yepp	Campbell St - QEII Drv	1.481	84	120	12.0	2022	2022	11.0	9.34E+05	1.23E+07	4,950	1.23E+07	11.0	0.00	0.0001	$44	70,290	1.22E+07	10.9	0.06	0.0016	$624
17																								
18	194	R'ton - Emu Pk	QEII Drv - Dean St	1.4	73	120	15.7	2026	2026	14.7	6.41E+05	1.19E+07	4,950	1.19E+07	14.7	0.00	0.0001	$44	70,290	1.19E+07	14.8	0.07	0.0017	$624
19		R'ton - Emu Pk	Dean St - Thozet Rd	1.1	73	120	15.7	2026	2026	14.7	3.63E+05	6.76E+06	4,950	6.76E+06	14.7	0.01	0.0002	$61	70,290	6.69E+06	14.5	0.12	0.0031	$867
20																								
21																								
22																								
23																								
24																								
25																								
26																								
27																								
28																								
29																								
30																								
																		$1,530						$22,695

Proposed Sand Quarry MCU, Fairy Bower

MRD INPUT DATA

Start of Development Traffic = 2011 (= PV Base Yr.)
Development Duration = 10 years

ESA Increase Trigger = 5.0%
Roughness Increase = 3 Counts / yr

Treasury Discount Rate = 6.0%

Sect. No.	Road No.	Road Name	Road Sections	Ch.	Ch	Length (km)	AADT 2010	HV % (2010)	Growth Adopt	ESA per HV	Exist. Rough (2010)	Terminal Rough.	Seal Width	Rehab. Costs Base Year 2007 $/km	Rehab. Costs PV Base Yr. 2011 $/lane-km	Mtce. Costs Base Year 2007 Mtce $/km	Mtce. Costs PV Base Yr. 2011 $/lane-km
		ROAD SECTIONS AND LENGTHS					ARMIS TRAFFIC DATA			CONDITION AND STANDARDS				Inflation % = 7.0% — UNIT COSTS - Inflated up from Base Yr.		Inflation % = 7.0%	
1	511	R'ton - Ridge	Bruce - Show Grd	0.0	0.8	0.8	6871	6.34	3.0%	3.2	103	120	12	$390,000	$255,605	$14,100	$9,241
2		R'ton - Ridge	Show Grd - Western St	0.8	2.0	1.2	4840	6.41	3.0%	3.2	120	120	9.5	$310,000	$203,173	$11,600	$7,603
3		R'ton - Ridge	Western St - Lion Ck Rd	2.0	2.2	0.2	3107	8.8	3.0%	3.2	76	120	8	$260,000	$170,403	$10,300	$6,751
4		R'ton - Ridge	Lion Ck Rd - Six Mile Rd	2.2	4.0	1.8	3107	8.8	3.0%	3.2	76	120	8	$260,000	$170,403	$10,300	$6,751
5		R'ton - Ridge	Six Mile Rd - Nine Mile Rd	4.0	4.7	0.7	1472	8.85	3.0%	3.2	89	120	7	$230,000	$150,742	$9,100	$5,964
6																	
7	10F	Bruce Hwy	Bolsolver St - Knight St	1.4	2.9	1.5	32373	7.71	3.0%	2.9	75	110	10	$325,000	$213,004	$12,200	$7,996
8		Bruce Hwy	Knight St - Alexandra St	2.9	3.5	0.7	32373	7.71	3.0%	2.9	75	110	10	$325,000	$213,004	$12,200	$7,996
9		Bruce Hwy	Alexandra St - Shopping Fair	3.5	4.3	0.8	32373	7.71	3.0%	2.9	75	110	10	$325,000	$213,004	$12,200	$7,996
10			Shopping Fair - Richardson R	4.3	5.5	1.2	15399	7.65	3.0%	2.9	68	110	10	$325,000	$213,004	$12,200	$7,996
11			Richardson Rd - Farm St	5.5	6.2	0.7	15399	10.84	3.0%	2.9	70	110	10	$325,000	$213,004	$12,200	$7,996
12																	
13																	
14																	
15																	
16	196	R'ton - Yepp	Campbell St - QEII Drv	0.1	1.6	1.5	22208	6.99	3.0%	3.2	84	120	12	$390,000	$255,605	$14,100	$9,241
17																	
18	194	R'ton - Emu Pk	QEII Drv - Dean St	0.0	1.4	1.4	17148	6.21	3.0%	3.2	73	120	12	$390,000	$255,605	$14,100	$9,241
19		R'ton - Emu Pk	Dean St - Thozet Rd	1.4	2.5	1.1	8451	7.14	3.0%	3.2	73	120	12	$390,000	$255,605	$14,100	$9,241
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
					Total =	13.5											

MRD INPUT COSTS

BITUMEN ROADS REHAB. & MTCE (incl. RESEAL) COSTS

INPUT COSTS		
Seal Width	Rehabilitation Costs	Annual Routine Mtce.
m	$ / km	$ / km
3.6	$115,000	$4,700
4	$127,860	$5,070
4.5	$150,360	$5,720
5	$160,000	$6,000
5.5	$177,500	$7,900
6	$195,000	$9,800
6.5	$212,500	$9,450
7	$230,000	$9,100
7.5	$245,000	$9,700
8	$260,000	$10,300
8.5	$277,500	$10,650
9	$295,000	$11,000
9.5	$310,000	$11,600
10	$325,000	$12,200
10.5	$342,500	$12,550
11	$360,000	$12,900
11.5	$375,000	$13,500
12	$390,000	$14,100
Base year for the above costs =		2007

OTHER INPUT DATA

(a) ESA's / HV = 2.9 ESA's/HV (Bruce Hwy)
= 3.2 ESA's/HV (All Other Roads)

(b) Roughness Increase = 3 counts per year

(c Terminal Roughness*= 110 NRM (Bruce Hwy)
= 120 NRM (All other Roads)

(d) Inflation Rate = 7%

(e) Discount Rate = 6%

(f) HV Growth Rate (background traffic) = adopt a constant 3% for all road sections, unless agreed otherwise by Central District.

*Note :- Terminal Roughness is considered to be a more realistic indicator of rehabilitation timing than pavement age or other methods of estimating the life of the existing pavement.

APPENDIX 3

Estimated Background Traffic ESA'S at Development Start Date (2011)

Pavement Design Life = 20 yrs

Sect. No.	Link	Road Section	Length (km)	Estimated ESA's per Year at Dev Start (2011) AADT Traffic (HV/day)									Design Traffic (20 yr life)	Background ESAs (EACH LANE) Year by Year without Dev										Cumul. B'ground ESAs
				2010	% HV	Growth	2011	%HV	Heavy	HV per LANE	ESA per HV	ESA's per Yr (2011)		1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 2020	
1	511	Bruce - Show Grd	0.8	6871	6.34	3.0%	7077	6.34	449	224	3.2	262,035	7.25E+06	2.62E+05	2.70E+05	2.78E+05	2.86E+05	2.95E+05	3.04E+05	3.13E+05	3.22E+05	3.32E+05	3.42E+05	3.00E+06
2		Show Grd - Western St	1.2	4840	6.41	3.0%	4985	6.41	320	160	3.2	186,618	5.16E+06	1.87E+05	1.92E+05	1.98E+05	2.04E+05	2.10E+05	2.16E+05	2.23E+05	2.30E+05	2.36E+05	2.43E+05	2.14E+06
3		Western St - Lion Ck Rd	0.16	3107	8.8	3.0%	3200	8.8	282	141	3.2	164,465	4.55E+06	1.64E+05	1.69E+05	1.74E+05	1.80E+05	1.85E+05	1.91E+05	1.96E+05	2.02E+05	2.08E+05	2.15E+05	1.89E+06
4		Lion Ck Rd - Six Mile Rd	1.84	3107	8.8	3.0%	3200	8.8	282	141	3.2	164,465	4.55E+06	1.64E+05	1.69E+05	1.74E+05	1.80E+05	1.85E+05	1.91E+05	1.96E+05	2.02E+05	2.08E+05	2.15E+05	1.89E+06
5		Six Mile Rd - Nine Mile Rd	0.715	1472	8.85	3.0%	1516	8.85	134	67	3.2	78,361	2.17E+06	7.84E+04	8.07E+04	8.31E+04	8.56E+04	8.82E+04	9.08E+04	9.36E+04	9.64E+04	9.93E+04	1.02E+05	8.98E+05
6																								0.00E+00
7	10F	Bolsolver St - Knight St	1.462	32373	7.71	3.0%	33344	7.71	2571	1285	2.9	1,360,616	3.77E+07	1.36E+06	1.40E+06	1.44E+06	1.49E+06	1.53E+06	1.58E+06	1.62E+06	1.67E+06	1.72E+06	1.78E+06	1.56E+07
8		Knight St - Alexandra St	0.6707	32373	7.71	3.0%	33344	7.71	2571	1285	2.9	1,360,616	3.77E+07	1.36E+06	1.40E+06	1.44E+06	1.49E+06	1.53E+06	1.58E+06	1.62E+06	1.67E+06	1.72E+06	1.78E+06	1.56E+07
9		Alexandra St - Shopping Fair	0.8	32373	7.71	3.0%	33344	7.71	2571	1285	2.9	1,360,616	3.77E+07	1.36E+06	1.40E+06	1.44E+06	1.49E+06	1.53E+06	1.58E+06	1.62E+06	1.67E+06	1.72E+06	1.78E+06	1.56E+07
10		Shopping Fair - Richardson Rd	1.2	15399	7.65	3.0%	15861	7.65	1213	607	2.9	642,173	1.78E+07	6.42E+05	6.61E+05	6.81E+05	7.02E+05	7.23E+05	7.44E+05	7.67E+05	7.90E+05	8.13E+05	8.38E+05	7.36E+06
11		Richardson Rd - Farm St	0.7	15399	10.84	3.0%	15861	10.84	1719	860	2.9	909,955	2.52E+07	9.10E+05	9.37E+05	9.65E+05	9.94E+05	1.02E+06	1.05E+06	1.09E+06	1.12E+06	1.15E+06	1.19E+06	1.04E+07
12																								0.00E+00
13																								0.00E+00
14																								0.00E+00
15																								0.00E+00
16	196	Campbell St - QEII Drv	1.481	22208	6.99	3.0%	22874	6.99	1599	799	3.2	933,763	2.58E+07	9.34E+05	9.62E+05	9.91E+05	1.02E+06	1.05E+06	1.08E+06	1.11E+06	1.15E+06	1.18E+06	1.22E+06	1.07E+07
17																								0.00E+00
18	194	QEII Drv - Dean St	1.4	17148	6.21	3.0%	17662	6.21	1097	548	3.2	640,553	1.77E+07	6.41E+05	6.60E+05	6.80E+05	7.00E+05	7.21E+05	7.43E+05	7.65E+05	7.88E+05	8.11E+05	8.36E+05	7.34E+06
19		Dean St - Thozet Rd	1.1	8451	7.14	3.0%	8705	7.14	622	311	3.2	362,958	1.00E+07	3.63E+05	3.74E+05	3.85E+05	3.97E+05	4.09E+05	4.21E+05	4.33E+05	4.46E+05	4.60E+05	4.74E+05	4.16E+06
20																								0.00E+00
21																								0.00E+00
22																								0.00E+00
23																								0.00E+00
24																								0.00E+00
25																								0.00E+00
26																								0.00E+00
27																								0.00E+00
28																								0.00E+00
29																								0.00E+00
30																								0.00E+00

Vehicle Combination / ESA Calculation

Bus/Truck

Axle Config. O O

	Axles / Tyres	Single / Single	Single / Dual				Total
Unloaded	Axle Group Load (t)	4.5	4				8.5
	Base Load / ESA's	5.4	8.2				
	Equiv. ESA's	0.482	0.057				0.54
Loaded	Legal Loading (t)	6	9				15
Payload (t)	Axle Group Load (t)	6.00	9.00				15.00
6.5	Equiv. ESA's [1]	1.524	1.451				2.98
					ESA/t Payload =		0.458

Tandem

Axle Config. O OO

	Axles / Tyres	Single / Single	Tandem / Dual				Total
Unloaded	Axle Group Load (t)	4.5	5				9.5
	Base Load / ESA's	5.4	13.8				
	Equiv. ESA's	0.482	0.017				0.50
Loaded	Legal Loading (t)	6	16.5				22.5
Payload (t)	Axle Group Load (t)	6.00	16.50				22.50
13	Equiv. ESA's [1]	1.524	2.044				3.57
					ESA/t Payload =		0.274

Tandem & Quad Dog

Axle Config. O OO OO OO

	Axles / Tyres	Single / Single	Tandem / Dual	Tandem / Dual	Tandem / Dual		Total
Unloaded	Axle Group Load (t)	4.5	5	5	5		19.5
	Base Load / ESA's	5.4	13.8	13.8	13.8		
	Equiv. ESA's	0.482	0.017	0.017	0.017		0.53
Loaded	Legal Loading (t)	6	16.5	16.5	16.5		55.5
Payload (t)	Axle Group Load (t)	6.00	16.50	16.50	16.50		55.50
36.00	Equiv. ESA's [1]	1.524	2.044	2.044	2.044		7.66
					Loaded ESA/t Payload =		0.213
					Unloaded ESA/t Payload =		0.015

Semi

Axle Config. O OO OOO

	Axles / Tyres	Single / Single	Tandem / Dual	Tri / Dual			Total
Unloaded	Axle Group Load (t)	4.5	5	6.5			16
	Base Load / ESA's	5.4	13.8	18.5			
	Equiv. ESA's	0.482	0.017	0.015			0.51
Loaded	Legal Loading (t)	6	16.5	20			42.5
Payload (t)	Axle Group Load (t)	6.00	16.50	20.00			42.50
26.5	Equiv. ESA's [1]	1.524	2.044	1.366			4.93
					ESA/t Payload =		0.186

B-Double

Axle Config. O OO OOO OOO

	Axles / Tyres	Single / Single	Tandem / Dual	Tri / Dual	Tri / Dual		Total
Unloaded	Axle Group Load (t)	4.5	5	6.5	6.5		22.5
	Base Load / ESA's	5.4	13.8	18.5	18.5		
	Equiv. ESA's	0.482	0.017	0.015	0.015		0.53
Loaded	Legal Loading (t)	6	16.5	20	20		62.5
Payload (t)	Axle Group Load (t)	6.00	16.50	20.00	20.00		62.50
40	Equiv. ESA's [1]	1.524	2.044	1.366	1.366		6.30
					ESA/t Payload =		0.157

Rd Train 1

Axle Config. O OO OOO OO OOO

	Axles	Single	Tandem	Tri	Tandem	Tri	Total

Unloaded	Axle Group Load (t)	4.5	5	6.5	5	6.5	27.5
	Base Load / ESA's	5.4	13.8	18.5	13.8	18.5	
	Equiv. ESA's	0.482	0.017	0.015	0.017	0.015	0.55
Loaded	Legal Loading (t)	6	16.5	20	16.5	20	79
Payload (t)	Axle Group Load (t)	6.00	16.50	20.00	16.50	20.00	79.00
51.5	Equiv. ESA's [1]	1.524	2.044	1.366	2.044	1.366	8.34
					ESA/t Payload =		0.162

proportioned between the unloaded and the loaded tonnages for that axle group.

Development Generated ESA's per Year

"Base" Annual Tonnage = 100,000

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
% of "Base" Annual Tonnage	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	Total
Annual Tonnage	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	1,000,000

Sect No.	Road No.	Road Section	%	Av. ESA / t To	Av. ESA / t From	TO(WARDS) - Development Generated ESA's (Year by Year) 1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 2020	Cumul. Dev Traffic ESA's
1	511	Bruce - Show Grd	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
2		Show Grd - Western St	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
3		Western St - Lion Ck Rd	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
4		Lion Ck Rd - Six Mile Rd	100.0%	0.0150	0.2130	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+04
5		Six Mile Rd - Nine Mile Rd	100.0%	0.0150	0.2130	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+03	1.50E+04
6																
7	10F	Bolsolver St - Knight St	67.0%	0.0150	0.2130	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+03	1.01E+04
8		Knight St - Alexandra St	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
9		Alexandra St - Shopping Fair	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
10		Shopping Fair - Richardson Rd	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
11		Richardson Rd - Farm St	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
12																
13																
14																
15																
16	196	Campbell St - QEII Drv	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
17																
18	194	QEII Drv - Dean St	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
19		Dean St - Thozet Rd	33.0%	0.0150	0.2130	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+02	4.95E+03
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29																
30																

Sect No.	Road Section	(AWAY) FROM - Development Generated ESA's (Year by Year) 1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 2020	Cumul. Dev Traffic ESA's
1	Bruce - Show Grd	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
2	Show Grd - Western St	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
3	Western St - Lion Ck Rd	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
4	Lion Ck Rd - Six Mile Rd	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+05
5	Six Mile Rd - Nine Mile Rd	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+04	2.13E+05
6												
7	Bolsolver St - Knight St	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+04	1.43E+05
8	Knight St - Alexandra St	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
9	Alexandra St - Shopping Fair	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
10	Shopping Fair - Richardson Rd	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
11	Richardson Rd - Farm St	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
12												
13												
14												
15												
16	Campbell St - QEII Drv	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
17												
18	QEII Drv - Dean St	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
19	Dean St - Thozet Rd	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+03	7.03E+04
20												
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28												
29												
30												

Saved Formula

Saved Formula

Development Generated ESA % (Year by Year)

ESA Increase Trigger = 5.0%

TO(WARDS) - Development Generated % Year by Year

Sect No.	Road No.		Road Section	1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 2020
1	511	-	Bruce - Show Grd	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%
2		-	Show Grd - Western St	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
3		-	Western St - Lion Ck Rd	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%
4		-	Lion Ck Rd - Six Mile Rd	0.9%	0.9%	0.9%	0.8%	0.8%	0.8%	0.8%	0.7%	0.7%	0.7%
5		-	Six Mile Rd - Nine Mile Rd	1.9%	1.9%	1.8%	1.8%	1.7%	1.7%	1.6%	1.6%	1.5%	1.5%
6													
7	10F	e	Bolsolver St - Knight St	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
8		e	Knight St - Alexandra St	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9		e	Alexandra St - Shopping Fair	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10			Shopping Fair - Richardson Rd	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
11			Richardson Rd - Farm St	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
12													
13													
14													
15													
16	196	-	Campbell St - QEII Drv	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
17													
18	194	E	QEII Drv - Dean St	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
19		E	Dean St - Thozet Rd	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

FROM - Development Generated % Year by Year

Sect No.	Road No.		Road Section	1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 2020
1	511	-	Bruce - Show Grd	2.7%	2.6%	2.5%	2.5%	2.4%	2.3%	2.2%	2.2%	2.1%	2.1%
2		-	Show Grd - Western St	3.8%	3.7%	3.6%	3.4%	3.3%	3.2%	3.2%	3.1%	3.0%	2.9%
3		-	Western St - Lion Ck Rd	4.3%	4.1%	4.0%	3.9%	3.8%	3.7%	3.6%	3.5%	3.4%	3.3%
4		-	Lion Ck Rd - Six Mile Rd	13.0%	12.6%	12.2%	11.9%	11.5%	11.2%	10.8%	10.5%	10.2%	9.9%
5		-	Six Mile Rd - Nine Mile Rd	27.2%	26.4%	25.6%	24.9%	24.2%	23.4%	22.8%	22.1%	21.5%	20.8%
6													
7	10F	e	Bolsolver St - Knight St	1.0%	1.0%	1.0%	1.0%	0.9%	0.9%	0.9%	0.9%	0.8%	0.8%
8		e	Knight St - Alexandra St	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%
9		e	Alexandra St - Shopping Fair	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%
10			Shopping Fair - Richardson Rd	1.1%	1.1%	1.0%	1.0%	1.0%	0.9%	0.9%	0.9%	0.9%	0.8%
11			Richardson Rd - Farm St	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%
12													
13													
14													
15													
16	196	-	Campbell St - QEII Drv	0.8%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%
17													
18	194	E	QEII Drv - Dean St	1.1%	1.1%	1.0%	1.0%	1.0%	0.9%	0.9%	0.9%	0.9%	0.8%
19		E	Dean St - Thozet Rd	1.9%	1.9%	1.8%	1.8%	1.7%	1.7%	1.6%	1.6%	1.5%	1.5%
20													
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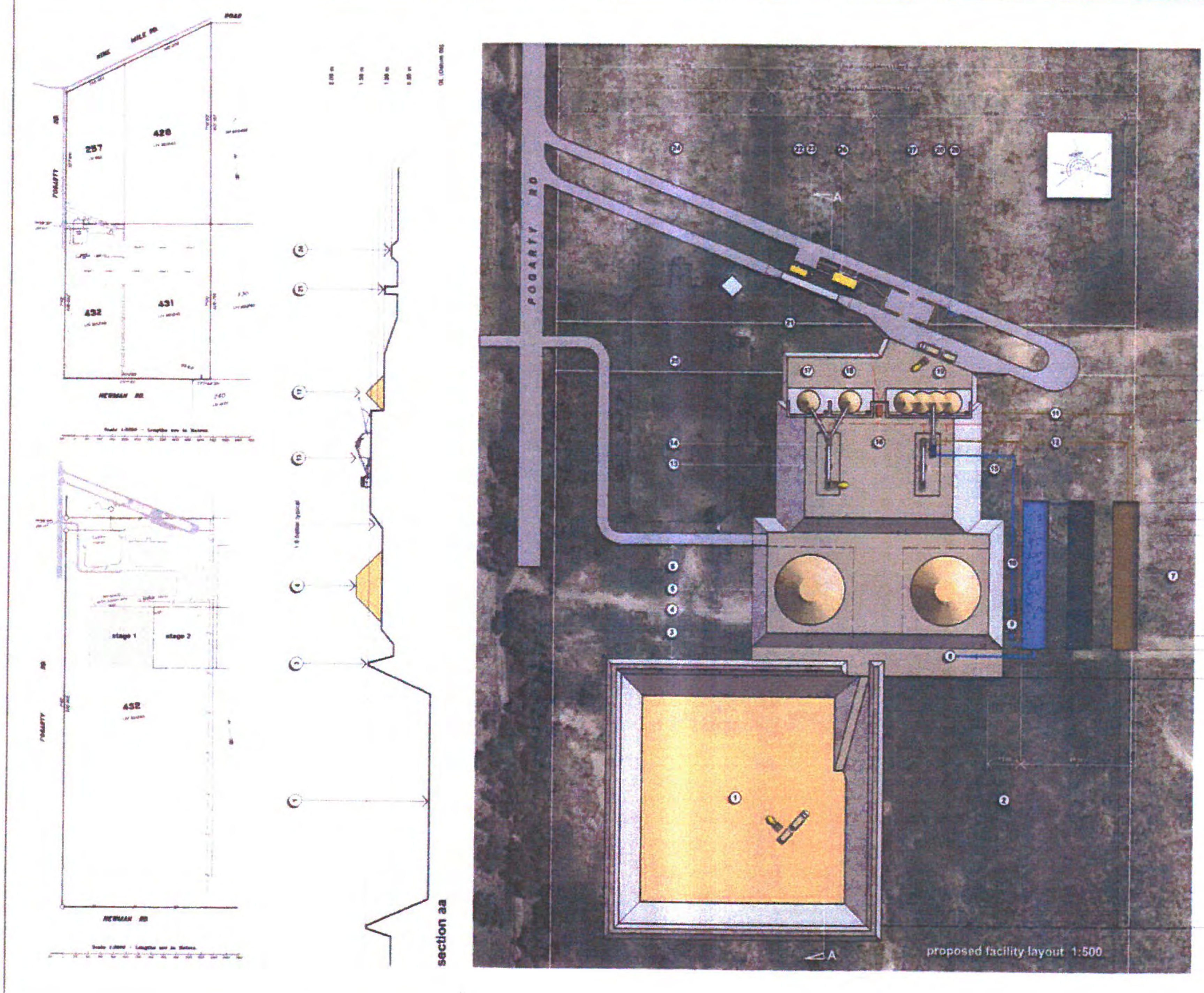
22													
23													
24													
25													
26													
27													
28													
29													
30													

APPENDIX D
Tapsell Consulting Engineers – Proposed Site Development Layout



GENERAL NOTES

LEGEND

1. Pit No. 1
2. Pit No. 2
3. 2m bundwall
4. Raw material stockpile pad (1m above GL)
5. Raw material stockpile
6. Secondary access road
7. Settling ponds
8. Fresh water supply
9. Return water pump
10. Return water
11. Waste water from bunds
12. Waste water from wash plant
13. Processing plant pad (2m above GL)
14. Dry screening plant
15. Wet screening/wash plant
16. Generator
17. Coarse processed material
18. Fine processed material
19. Washed fine processed material
20. Loading area
21. Weigh bridge
22. Weigh bridge monitoring office wc
23. Staff carpark
24. One way primary access road
25. Existing cattle yards
26. Staff lunch room and amenities
27. Secure vehicle compound
28. Screened industrial waste bins

TAPSELL CONSULTING ENGINEERS Pty Ltd
14 Milford Avenue North Rockhampton

Approved: RPEQ 3164

Date:

Paul Waardyk

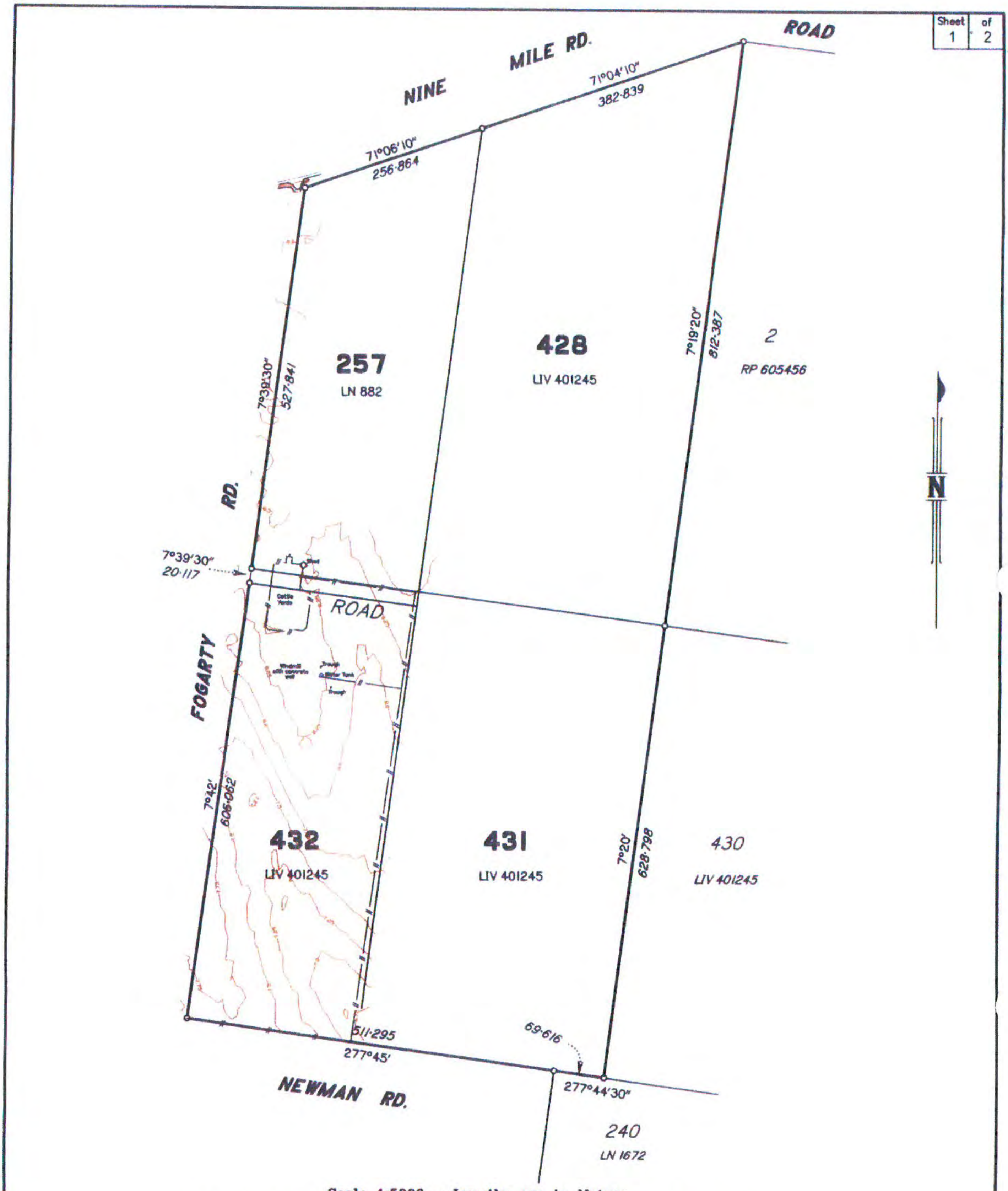
Proposed sand and gravel extraction and processing facility

Lots 257, 428, 431 & 432
LIV 401245
Fogarty Rd
Rockhampton

Proposed Site Development Layout

1:100 A0 WD 1057.1

APPENDIX E
Schlencker Surveying – Detail and Level Survey Plan



Scale 1:5000 - Lengths are in Metres.

50 0 50 100 150 200 250 300 350 400 450 500 550 600 650 700

Notes:

This plan was prepared from a combination of field survey and existing records for the purpose of designing new construction on the land and should not be used for any other purpose.

The title boundaries shown hereon were marked by the author at the time of survey (See IS227382).

Services were not located at the time of survey. Prior to any demolition, excavation, or construction on the site a detailed search of 'Dial Before You Dig' and any relevant service provider should be undertaken to ascertain the existence of further services (if any) and the accurate location of all services. Schlencker Surveying cannot accept responsibility for any loss or damage, howsoever suffered, to any person or corporation who contravenes this note.

This note is an integral part of this plan. Reproduction of this plan in full or in part without this note will render the information shown on such reproduction invalid.

Level Datum is AHD derived PSM 45162 RL= 7.841m 4th Order.

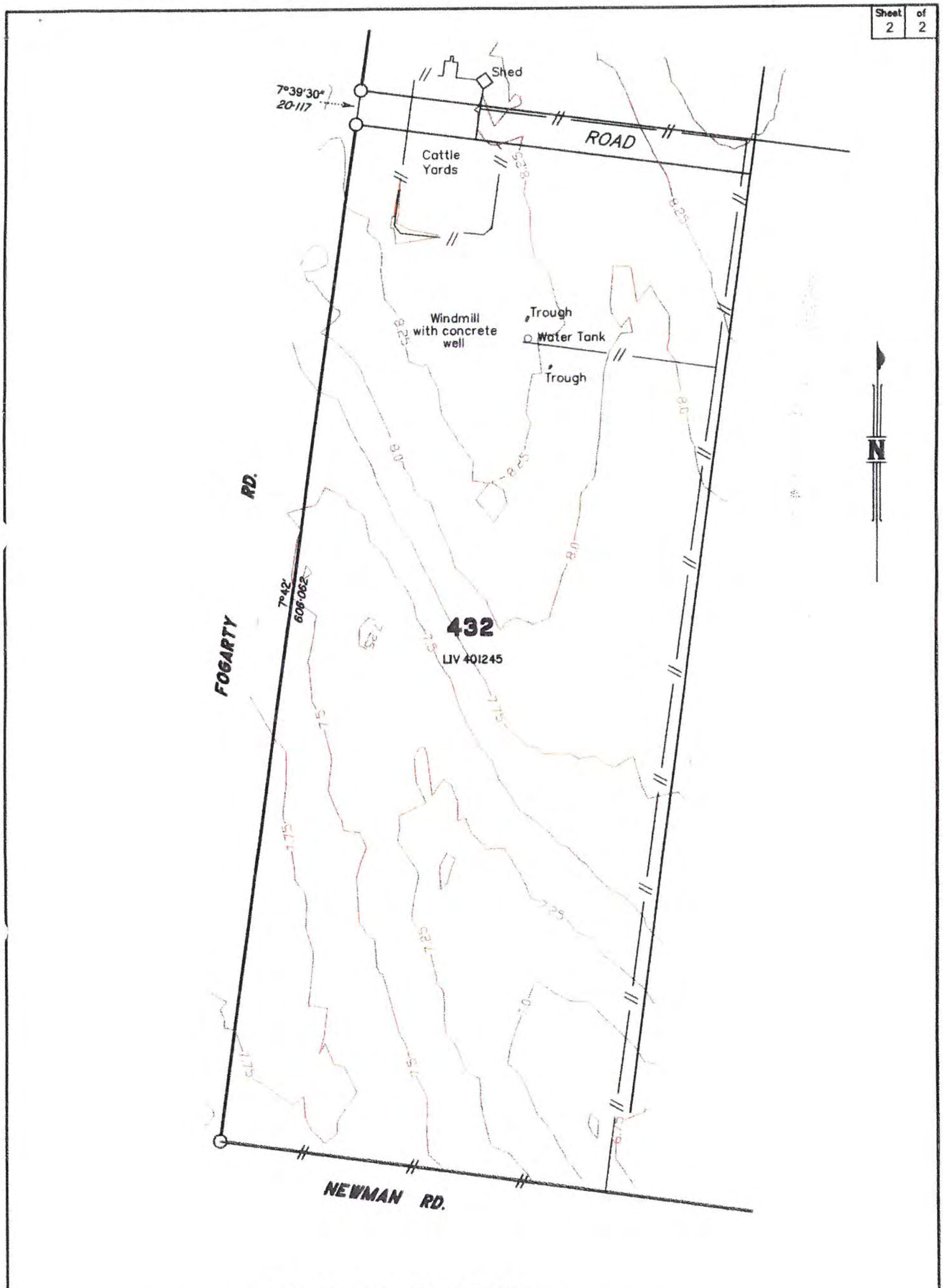
Plan of:

Detail and Level Survey of Part of Lot 257 on LN882 & Lot 432 on LIV401245

SCHLENCKER SURVEYING
A.B.N. 54 516 250 722
SURVEYING, MAPPING & DEVELOPMENT CONSULTANTS
181 East St., ROCKHAMPTON
Ph. (07) 49 271744
Fax (07) 49 223154
Also at BRISBANE & GOLD COAST

Horizontal Datum:	Drawn:	Scale
C.A.M.	DCE	1:5000 (A3)
Meridian: MGA by RTK GPS	Date: 01-09-2010	Parish ROCKHAMPTON
Vertical Datum: AHD	AutoCAD Scale: 1:1000	County: Livingstone
Derived from: -	Backup -	Ref 6208-02

0 50 mm 100 mm 150 mm



Scale 1:2000 - Lengths are in Metres.

APPENDIX F
Vehicle Swept Path Plans

0 5 10 15
1:250 (A1), 1:500 (A3)

All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked	Surveyor:	Approved:
						/ /
A	SUBMITTED FOR APPROVAL				Datum –	Certified: / /
	AMENDMENTS					RPEQ / /

McMurtrie consulting engineers

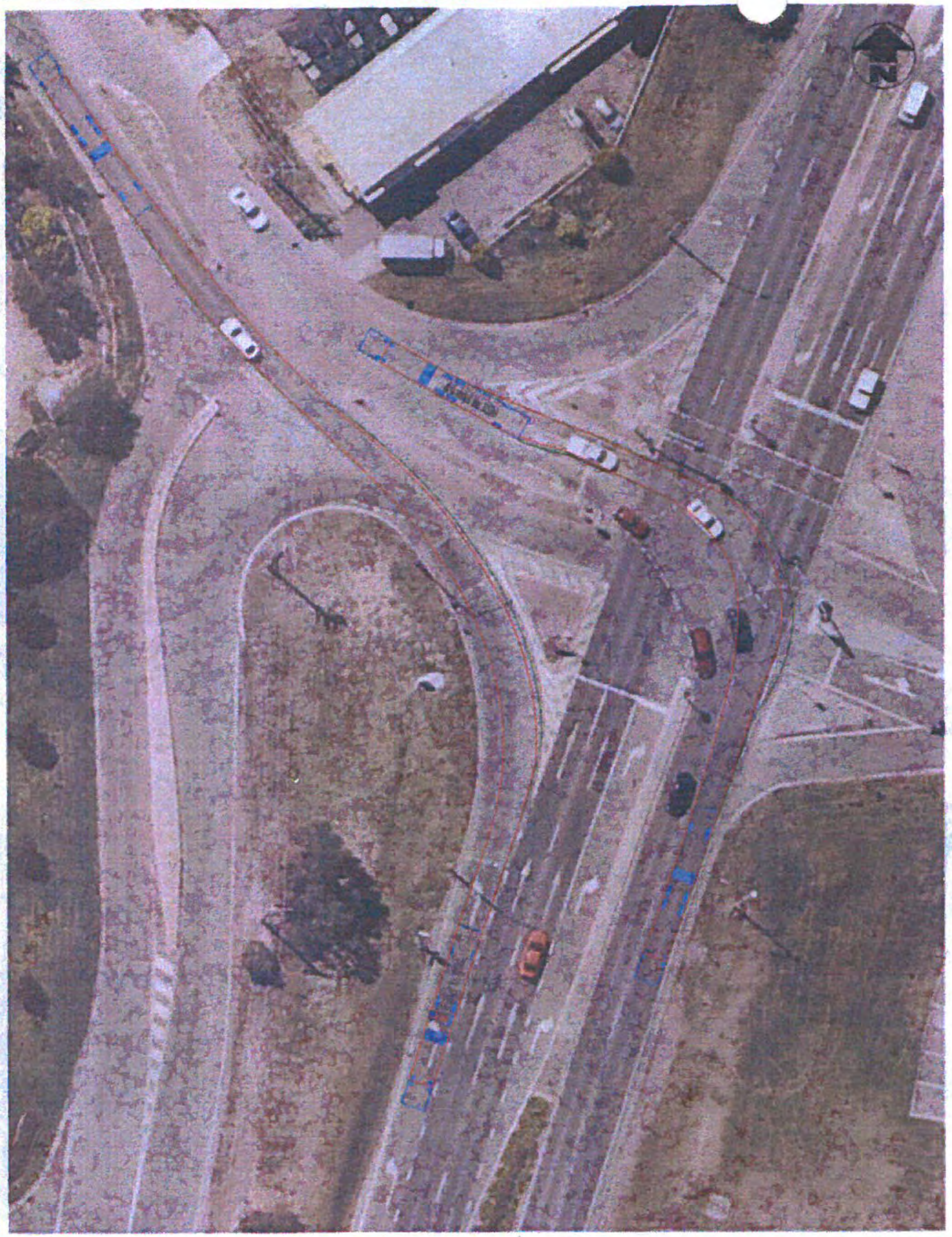
Address: 63 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 7149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 671 068
Fax: (07) 4921 1790

PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG / 19m SEMI
BRUCE HWY & BOLSOVER ST INTERSECTION

Revision No: A
Drawing Number
0261011-01VP
SHEET 1 OF 8 SHEETS

Plot Date : 28/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Woordyk\Drawings\Planning\Final Drawings\Vehicle Swept Paths.dwg

Plot Date : 02/11/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Woordyk\Drawings\Planning\Final Drawings\Vehichle Swept Paths.dwg



0 5 10 15
1:250 (A1), 1:500 (A3)
All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked
	SUBMITTED FOR APPROVAL			
	AMENDMENTS			

Surveyor:
Datum: -
Approved: / /
Certified: / /
RPEQ / /

McMurtrie consulting engineers
Address: 53 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149 WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG / 19m SEMI
BRUCE HWY & KNIGHT ST INTERSECTION

Drawing Number: 0261011-02VP
Revision No: A
SHEET 2 OF 8 SHEETS

0 5 10 15
1:250 (A1), 1:500 (A3)
All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked
A	SUBMITTED FOR APPROVAL			
AMENDMENTS				

Surveyor:
Datum: -
Approved: / /
Certified:
RPEQ / /

McMurtrie consulting engineers

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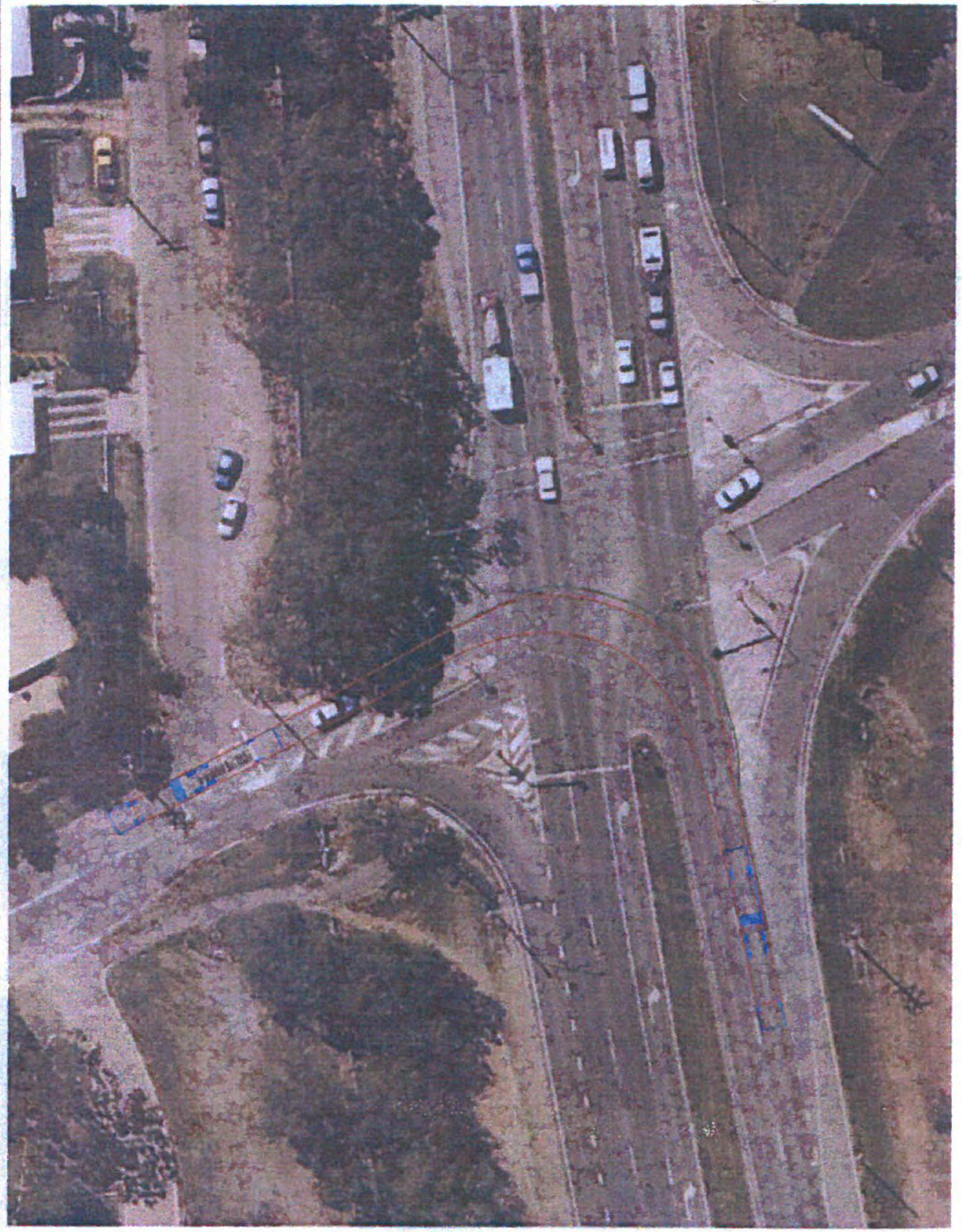
Postal: PO BOX 2149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG / 19m SEMI
FARM ST, McLAUGHLIN ST & SCOTT ST INTERSECTION

Revision No: A
Drawing Number
0261011-03VP
SHEET 3 OF 8 SHEETS

Plot Date : 25/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Waardyk\Drawings\Planning\Final Drawings\Vehicle Swept Paths.dwg

Plot Date 25/10/2010
Filename S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Woordyk\Drawings\Planning\Final Drawings\Vehichle Swept Paths.dwg



0 5 10 15
1:250 (A1), 1:500 (A3)

All dimensions in metres unless stated otherwise.

Rev.	Description	Date	Designed	Checked
A	SUBMITTED FOR APPROVAL			
	AMENDMENTS			

Surveyor:
Datum:-
Approved: / /
Certified: / /
RPEQ / /

McMurtrie consulting engineers

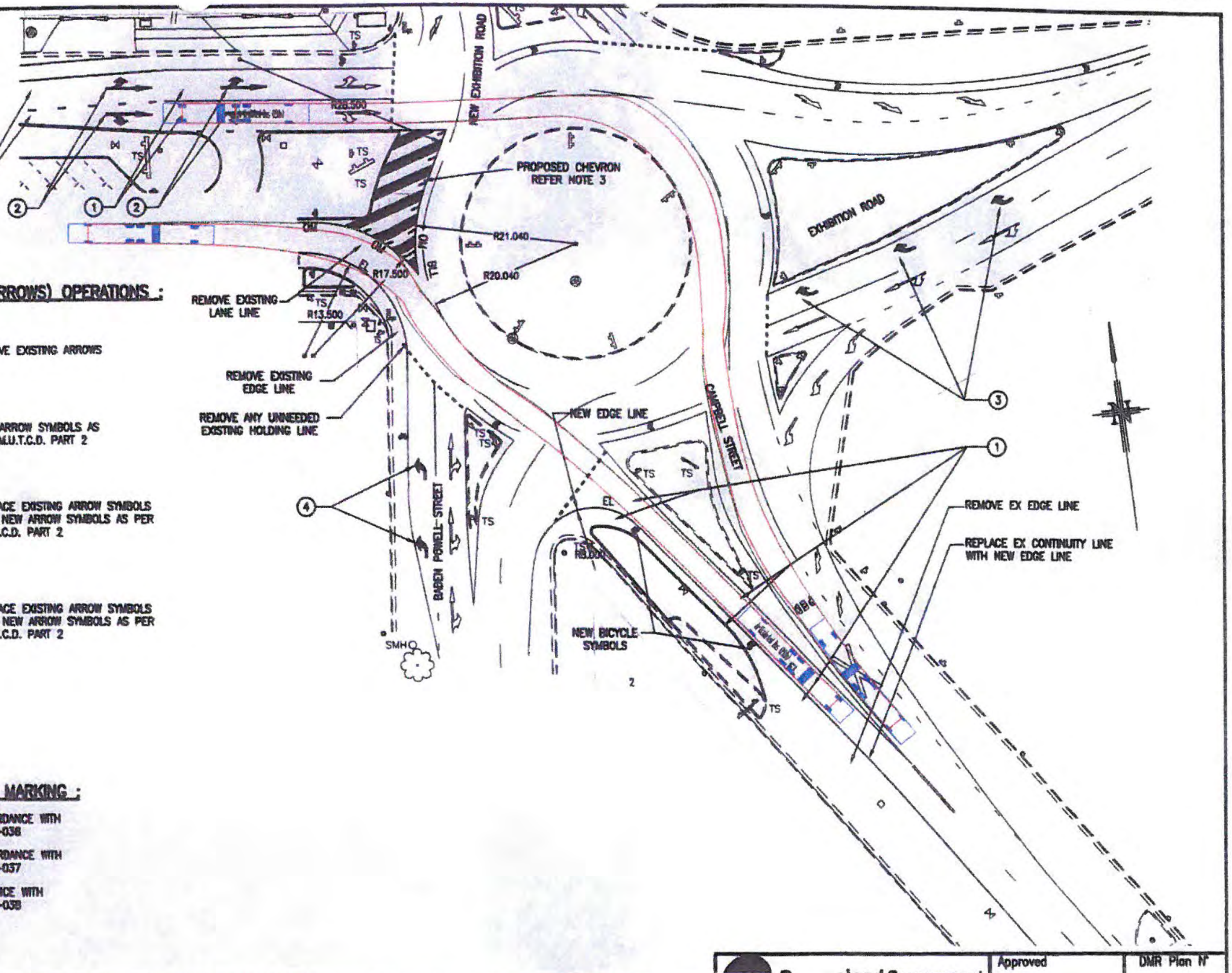
Address: 83 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG / 19m SEMI
BRUCE HWY & CARLTON ST INTERSECTION

Revision No: A

Drawing Number
0261011-04VP

SHEET 4 OF 8 SHEETS



PAVEMENT MARKING (ARROWS) OPERATIONS :

① REMOVE EXISTING ARROWS

② NEW ARROW SYMBOLS AS PER M.U.T.C.D. PART 2

EXISTING / NEW ③ REPLACE EXISTING ARROW SYMBOLS WITH NEW ARROW SYMBOLS AS PER M.U.T.C.D. PART 2

EXISTING / NEW ④ REPLACE EXISTING ARROW SYMBOLS WITH NEW ARROW SYMBOLS AS PER M.U.T.C.D. PART 2

NOTES ON PAVEMENT MARKING :

1. LINE-MARKING IN ACCORDANCE WITH STANDARD DRAWING SD-036
2. PARKING BAYS IN ACCORDANCE WITH STANDARD DRAWING SD-037
3. CHEVRONS IN ACCORDANCE WITH STANDARD DRAWING SD-038

0 5 10 15
1:250 (A1), 1:500 (A3)
All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked	Surveyor:	Approved:
A	SUBMITTED FOR APPROVAL				Datum:-	Certified:
	AMENDMENTS					RPEQ

McMurtrie consulting engineers
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E-mail: mail@mcmengineers.com

PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG
ROCKY RIDGELANDS RD & CAMPBELL ST INTERSECTION

Revision No: A
Drawing Number 0261011-05VP
SHEET 5 OF 8 SHEETS

Plot Date : 25/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Woordyk\Drawings\Planning\Final Drawings\Vehicle Swept Paths.dwg

Plot Date 25/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Waardyk\Drawings\Planning\Final Drawings\Vehichle Swept Paths.dwg

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1:250 (A1), 1:500 (A3)

All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked
A	SUBMITTED FOR APPROVAL			
	AMENDMENTS			

Surveyor:

Datum:-

Approved:

Certified:

RPEQ

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PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG
CAMPBELL ST & ARCHER ST INTERSECTION

Revision No: A

Drawing Number
0261011-06VP

SHEET 6 OF 8 SHEETS

Plot Date : 25/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Noordyk\Drawings\Planning\Final Drawings\Vehicle Swept Paths.dwg

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All dimensions in metres unless stated otherwise.

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PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG
CAMPBELL ST & FITZROY ST INTERSECTION

Drawing Number: 0261011-07VP
Revision No: A
SHEET 7 OF 8 SHEETS

Plot Date : 25/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Woordyk\Drawings\Planning\Final Drawings\Vehichle Swept Paths.dwg

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All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked	Surveyor:	Approved:
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PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG
LAKES CK RD & THOZET RD INTERSECTION

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Revision No: A

Drawing Number
0261011-08VP

SHEET 8 OF 8 SHEETS

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PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG / 19m SEMI
BRUCE HWY & FARM ST INTERSECTION

Revision No: A

Drawing Number: 0261011-09VP

SHEET 1 OF 1 SHEETS

Plot Date : 29/10/2010
Filename : S:\PROJECT RECORDS\026-10-11 Proposed Sand Quarry For P Woordyk\Drawings\Planning\Final Drawings\Vehicle Swept Paths.dwg

Plot Date 29/10/2010
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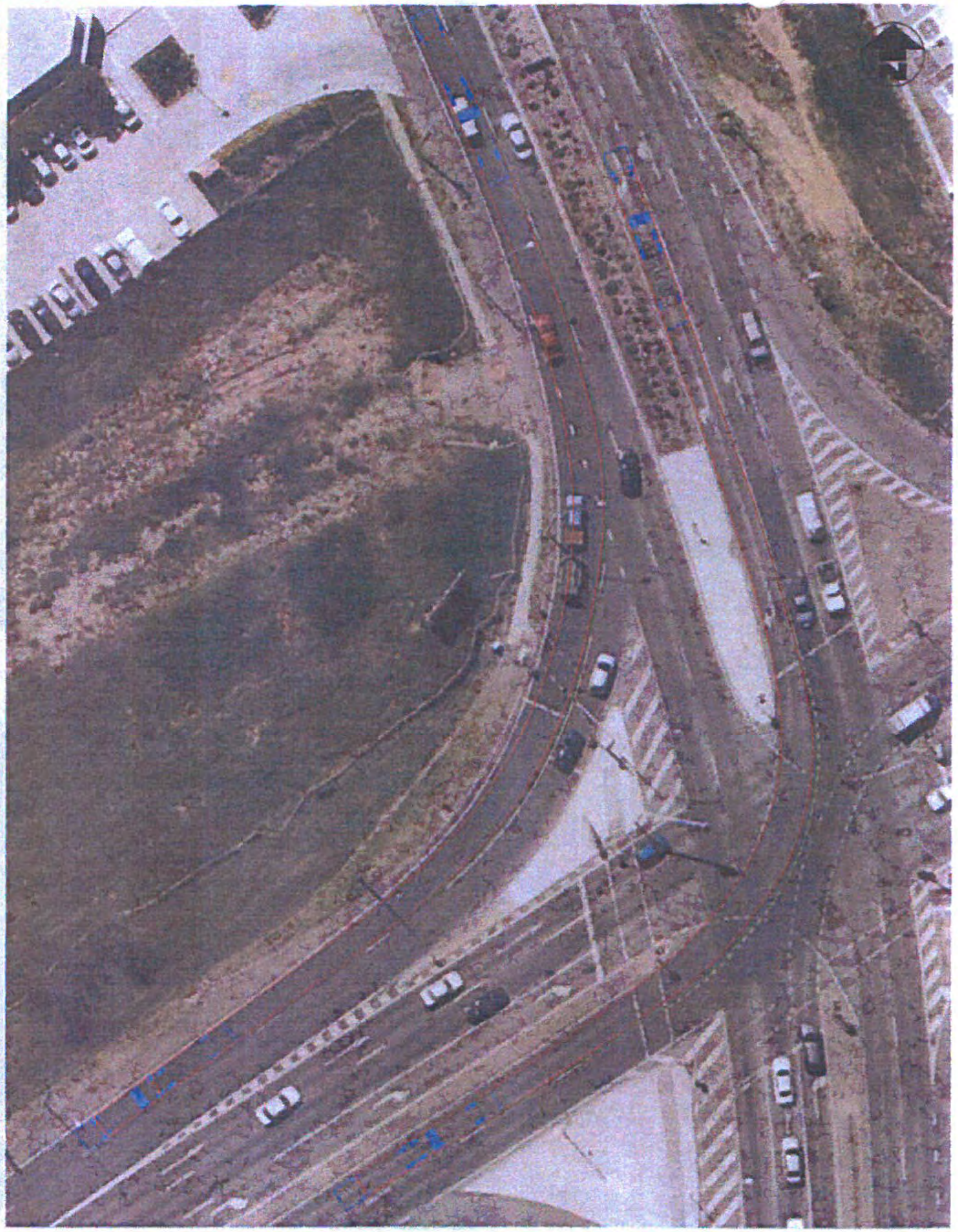

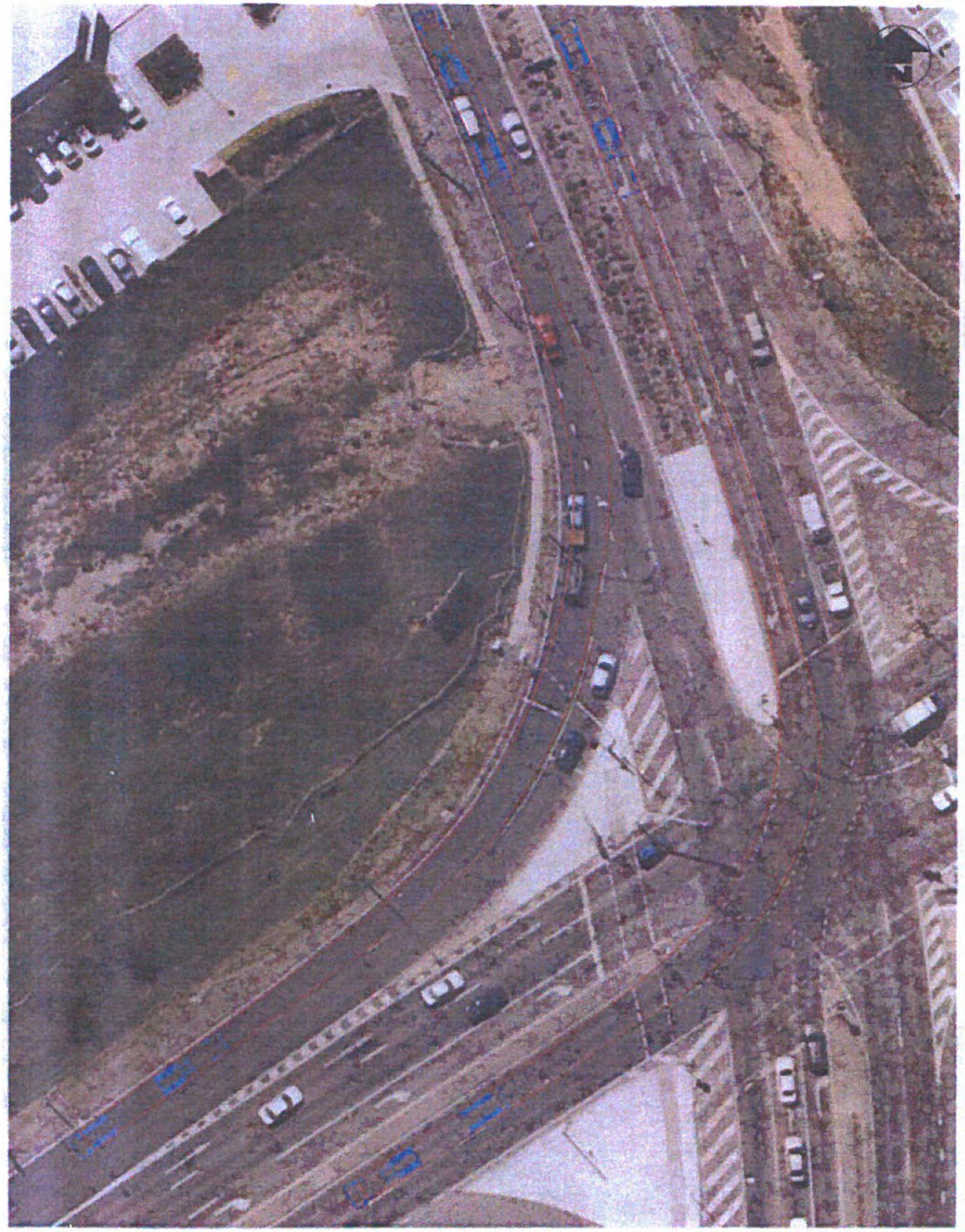

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1:250 (A1), 1:500 (A3)
All dimensions in metres unless stated otherwise

Rev.	Description	Date	Designed	Checked
A	SUBMITTED FOR APPROVAL			
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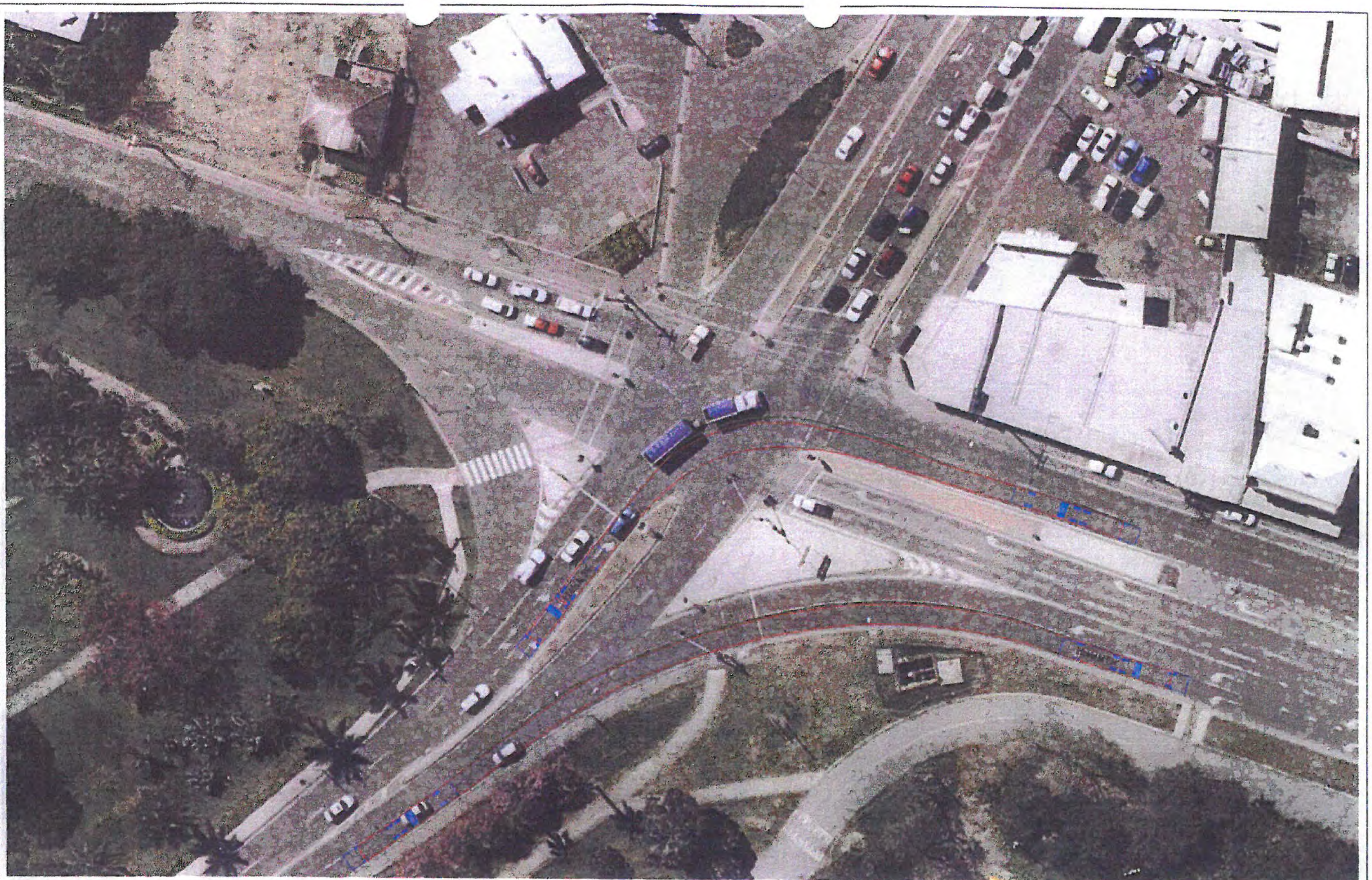
PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER
VEHICLE SWEPT PATHS: TRUCK AND DOG / 19m SEMI
BRUCE HWY & MUSGRAVE ST INTERSECTION

Drawing Number 0261011-10VP
Revision No: A
SHEET 1 OF 1 SHEETS



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PROPOSED SAND QUARRY
FOGARTY ROAD, FAIRY BOWER

VEHICLE SWEPT PATHS: TRUCK AND DOG
QUEEN ELIZABETH DR & LAKES CK RD INTERSECTION

Revision No: A
Drawing Number: 0261011-11VP
SHEET 1 OF 1 SHEETS

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Rockhampton - Brisbane - Gold Coast

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Our Ref: 5652:AMC:caw

Your Ref: Ecotrack 350765
Trackjob: IC0710ROK0012

29 November, 2010

Senior Planning Officer
Department of Environment and Resource Management
PO Box 1762
ROCKHAMPTON QLD 4700

Dear Sir/Madam

RE: Proposed Material Change of Use – Impact for Extractive Industry
Application No. D/225-2010
Lot 250 on RP2621, Lot 4 on LN883 & Lot 1 on RP603316
Situated at 473 Nine Mile Road, Fairy Bower for John Foxlee

Further to your Request for Further Information dated 16 August, 2010 we advise as follows:-

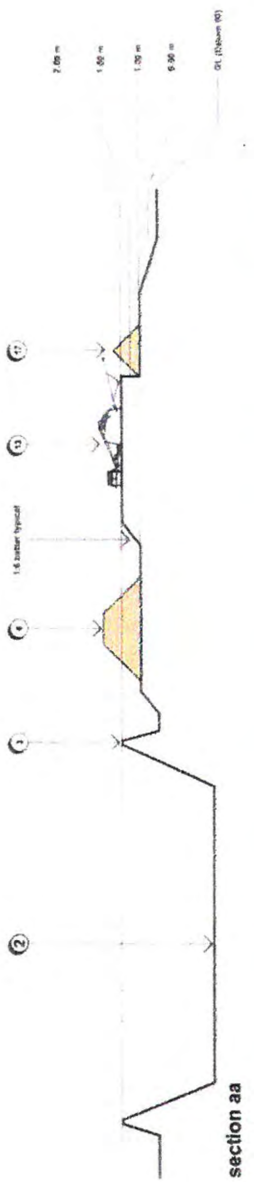
1. Please refer to attached Proposed site Development Layout Plan WD 1057.2 Rev A
2. Please refer to Waste Solutions Australia Pty Ltd Groundwater Investigation Report dated October, 2010.

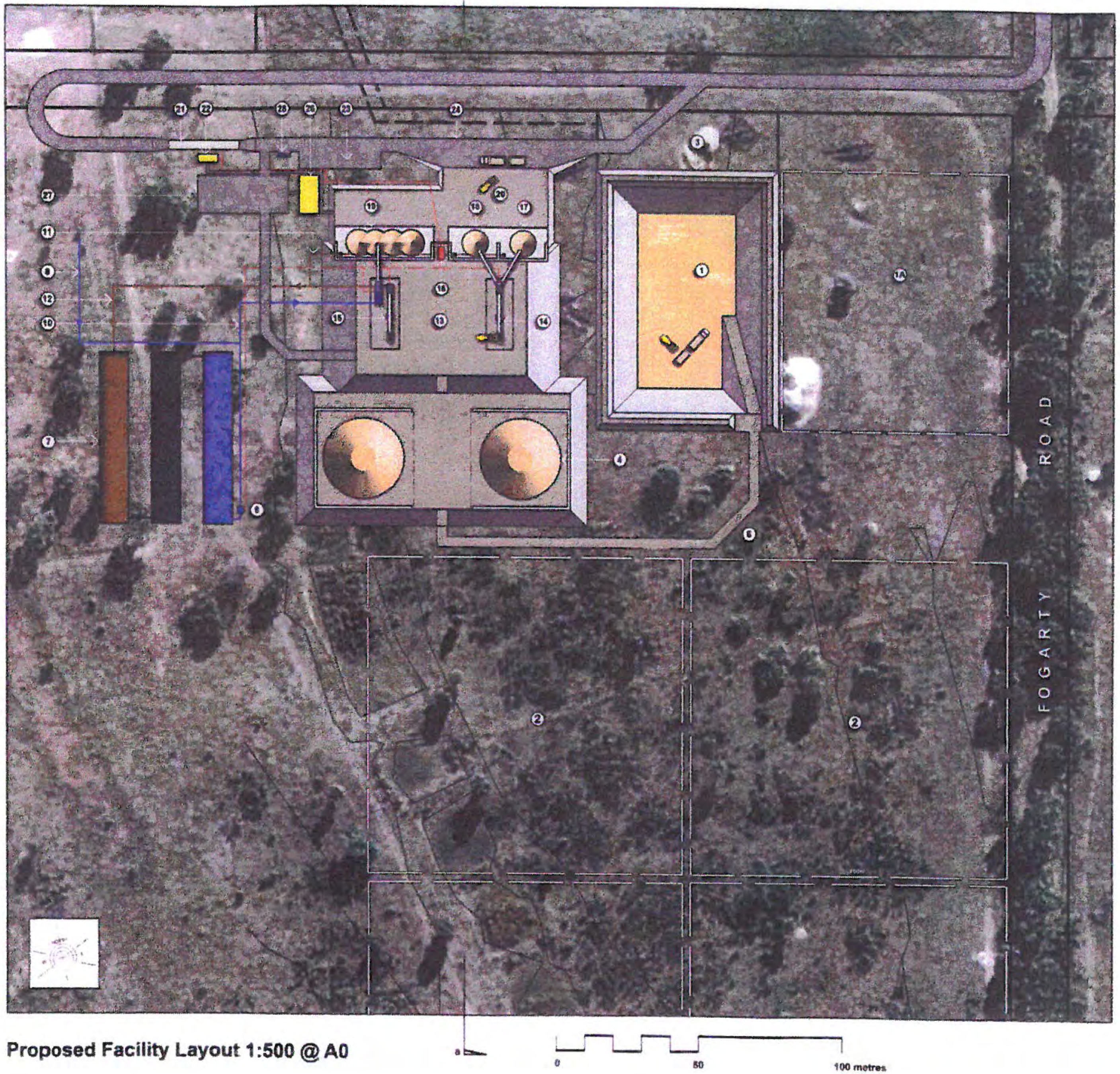
We also attach completed Notice for response to Information Request.

Please do not hesitate to contact our office should you have any queries.

Yours faithfully
SCHLENCKER SURVEYING

A.M. CUMNER
Cadastral Surveyor





Proposed Facility Layout 1:500 @ A0

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LEGEND

1 Quarry Site 1A Stage 2 Quarry Site
2 Possible Future Development
3 2m bundwall
4 Raw material stockpile pad (1m above GL)
5 Raw material stockpile
6 Secondary access road
7 Settling ponds
8 Fresh water supply
9 Return water pump
10 Return water
11 Waste water from bunds
12 Waste water from wash plant
13 Processing plant pad (2m above GL)
14 Dry screening plant
15 Wet screening/wash plant
16 Generator
17 Coarse processed material
18 Fine processed material
19 Washed fine processed material
20 Loading area
21 Weigh bridge
22 Weigh bridge monitoring office,wc
23 Staff carpark
24 One way primary access road
25 Future extraction stages
26 Staff lunch room and amenities
27 Secure vehicle compound
28 Screened industrial waste bins

D. Wickerson
WICKERSON DESIGN
Ph 49 210 525

Surveying
Schlencker Surveying

Client
John Foxlee

Project
Proposed sand and gravel extraction and processing facility

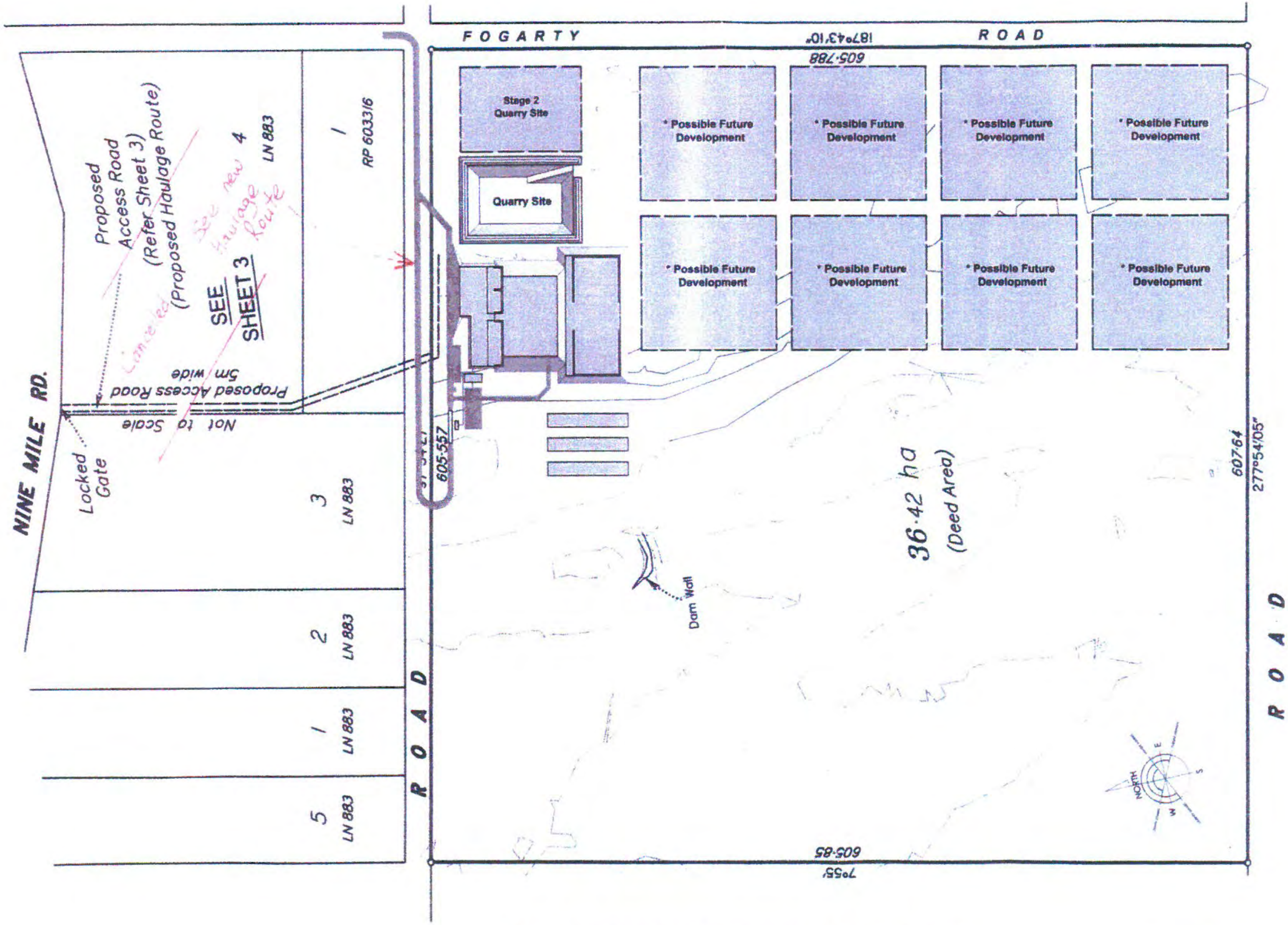
Site
Lot 250 on R2621, Lot 4 on LN883 &
Lot 1 on RP603316
Parish of Cawarral
County of Livingstone

Drawing Title
Proposed Site Development Layout

DRAWING PRODUCTION

Design	DMW
Drawn	DMW
Checked	PW
Date	Sept 2010

Scale	Sheet Size	Drawing No	Rev.
1:100	A0	WD 1057. 2	A



Site Development Layout

Scale 1:1000 @ A0

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LEGEND

NO	AMENDMENT	DATE	INT'L

Surveying

Schlencker Surveying

Client

John Foxlee

Project

Proposed sand and gravel extraction and processing facility

Title

Lot 250 on R2621, Lot 4 on LN883 &
Lot 1 on RP603316
Parish of Cawarral
County of Livingstone

Drawing Title

Proposed Site Development Layout

DRAWING PRODUCTION

Design: D Wickerson
Drawn: D Wickerson
Checked: PW
Date: Sept 2010

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WICKERSON DESIGN
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Scale	Sheet Size	Drawing No	Rev
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GROUNDWATER INVESTIGATION IN SUPPORT OF THE EXTRACTION OF SAND OFF FOGARTY ROAD, FAIRY BOWER



waste solutions
AUSTRALIA PTY LTD

John Foxlee

RN10 W565/01-02
October 2010

Document Control Summary Sheet

Title: Investigation in Support of the Development Application for the Extraction of Sand off Fogarty Road, Fairy Bower

Document Type : Report

Issued By: Waste Solutions Australia Pty Ltd

Author/s: John Cody

Paul Smith

Client: John Foxlee

Document ID: RN10 - W565/01-02

Revision Status:

Revision	Date	Author	Verified	Status
A	22/10/2010	J. Cody	P. Smith	Final

Executive Summary

Waste Solutions Australia Pty Ltd (WSA) was requested to draft a response to DERM's information request regarding John Foxlee's Development Application for a planned sand extraction site at Fogarty Road, Fairy Bower, QLD. WSA investigated the subjects raised by DERM and provided detailed responses to each query. Numerical models were created to assess the worst-case impact the sand extraction could have on groundwater levels, both in the instance that sand is removed above the water table (Option 1) and a second option in which the groundwater table within the extraction pit is lowered by 2.5 metres to allow sand to be extracted.

The results of the numerical modelling (Option 1b and Option 2) show that after an operational period of twenty years only a minor drawdown is produced both at a neighbouring pumping bore and at the boundary of the Fitzroy Subartesian Declared Area. However, this is not the case for Option 1 a where the modelling produces a 1.1m drawdown at the boundary of the Declared Area.

Monitoring programs for the proposed sand extraction scheme have been outlined.

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GLOSSARY OF TERMS

Aquifer
A soil, rock layer, group of layers or part of a layer, that is sufficiently saturated and permeable to yield significant quantities of water to bores and wells.

Aquifer Boundary
A lateral discontinuity or change in the aquifer caused by a significant change in hydraulic conductivity, storage changes or recharge.

Blowdown The difference between the observed water level during the pumping, and the non-pumping water level.

Cone of Depression
The shape of the water table or potentiometric surface decline around a pumping, flowing or recharge bore.

Confined (or Pressure or Artesian) Aquifer
A completely saturated aquifer in which the upper and lower boundaries are impermeable layers. The groundwater is contained under sufficient pressure to cause it to rise above the aquifer if the top impermeable layer is breached; the level to which the water would rise is called the potentiometric surface.

Confining Bed
A layer of impermeable material adjacent to one or more aquifers. Its hydraulic conductivity may vary from zero to some value much lower than that of the aquifer.

Delayed Yield
In an unconfined or semi-confined aquifer the full gravity drainage of water is not immediate due to delayed drainage (yield) of the interstices. With long periods of pumping, this delayed yield affect reduces to near zero.

Drawdown
The difference between the observed water level during the pumping, and the non-pumping water level.

Hydraulic Gradient
The change in standing or hydraulic head divided by the flow path in a given direction. If not specified the direction is generally understood to be that of the maximum rate of decrease in head.

Leakage Coefficient
Generally applied to semi-confining layer and is the vertical hydraulic conductivity divided by the flow path, taken as the thickness m of the layer, i.e. K/m. The vertical flow rate per unit area is obtained by multiplying the leakage coefficient and the hydraulic head acting across the layer.

Residual Drawdown
The difference between the observed water level during the recovery period following pumping and the non-pumping water level.

Recovery
The difference between the observed water level during the recovery period following pumping and the maximum water level measured when pumping stopped.

Semi-confined (or Leaky) Aquifer
The confining layers of many pressure aquifers are not completely impermeable and thus allow vertical leakage of water to occur.

Specific Yield (S_y)
The volume of water released from a unit volume of saturated aquifer material drained by a falling watertable.

Storage Coefficient or Storativity (S)
The volume of water an aquifer releases from or takes into storage per unit area of the aquifer per unit change in head. In a confined aquifer system, the water derived from storage with decline in head comes from expansion of the water and compression of the aquifer. When water is added to storage the rise in head is accommodated by compression of the water and expansion of the aquifer. In an unconfined aquifer system the amount of water derived from or added to the aquifer by these processes generally is negligible compared to that involved in gravity drainage or filling of pores. Storativity in a confined aquifer, is a function of the aquifer thickness b, and has no dimensions. For a confined aquifer the range is 10^{-3} to 10^{-5}, whilst for an unconfined aquifer it normally ranges between 10^{-2} - 10^{-3}.

Sustained Yield
The long-term pumping yield of a bore or wellfield under natural or established artificial conditions. The values are normally calculated from short-term tests, making allowance for hydrogeological, and climatic conditions at the site.

Transmissivity (T)
The rate at which water at the prevailing viscosity can be transmitted through a unit strip of aquifer under a unit gradient.

$$T = Kb$$

where K = **hydraulic conductivity** (also known as coefficient of permeability)
b = aquifer thickness

Dimensions of T : Volume / unit time / unit width. Units used are m^3 / day / m or m^2 / day

Unconfined Aquifer
A permeable soil or rock layer which is either partly filled with water and or has no impermeable or semi-impermeable layer restricting a rise in the water table. It is normally underlain by a relatively impermeable layer. It contains groundwater that is not subjected to any pressure other than its own weight.

1 PROPERTY SUMMARY

Real Property Description	Lot 250 at R2621, Lot 4 on LN883 and Lot 1 on RP603316. Only Lot 250 will be used for sand extraction
Owner	Lot 250 at R2621, Lot 4 on LN883 and Lot 1 on RP603316 are owned by John Foxlee.
Area	Total of 56.3 ha (0.56km^2) , 0.42km^2 of which (Lot 250) is sand extracting area
Local Authority Area	Rockhampton Regional Council (RRC)
Previous Use	Grazing of cattle
Current Use	Vacant
Proposed Use	Sand extraction with grazing of cattle on remaining land

2 INTRODUCTION

2.1 BACKGROUND

Waste Solutions Australia Pty Ltd (WSA) was requested to draft a response to DERM's information request regarding John Foxlee's Development Application for a planned sand extraction site at Fogarty Road, Fairy Bower, QLD. The intended development area comprises four lots to the west of Fogarty Road (these being Lot 250 at R2621, Lot 4 on LN883 and Lot 1 on RP603316). The location is shown in ***Figure 1***.

2.2 SCOPE OF WORK

WSA was required to provide responses (in the form of a report) to the following information requested by DERM:

- A description of ground water table and flow in the immediate and surrounding areas
- Use of the water resulting from the extraction (if any)
- Potential impacts on ground water and other users
- Extent of the excavation depth
- Mitigation measures on surrounding ground water resources if adverse impacts occur

3 PROCESS DESCRIPTION

It is the intent of the land owner that the location be used for sand mining. The methodology that is proposed is as follows:

- Removal of topsoil and vegetation by excavator and articulated dump truck. Topsoil will be stockpiled for use in rehabilitation.
- Sand to be removed by excavator, transferred to dump trucks and stockpiled behind the process plant. The detailed site development plan is shown in ***Figure 2***.

- Unwashed sand to be loaded into the screening plant (Finlay 390), where it will be screened and rinsed and then pumped as a slurry into the Finlay 200E to undergo further washing before being partially dried and stockpiled.
- Water that will be used to wash the sand will be channelled via a silt trap to the primary settling pond. The settling ponds are shown in ***Figure 2*** and are also highlighted in blue in ***Figure 3.*** Washed sand will sit for 24 hours to further drain into the Concrete bunker. All site stockpiles will be fully bunded to prevent loss of run-off.
- Excess water from the bunded stockpiles will enter the silt drain and be diverted to the settling ponds, as shown in ***Figure 2***. Silt removed from the silt traps will be stock piled for use in rehabilitation.
- The washed sand will be stockpiled for delivery.
- The initial source of water for the plant will be extracted with an electric pump from an onsite bore which will be used to fill the third settling pond. Water needed for site operations will be drawn from the settling pond via a pressure pump and fed into both the screen and the washing wheel. From this point onwards, the aim will be to recycle the existing water, and use the bore only for occasional top-ups that will replace evaporative losses and losses in the exported sand product.
- Perimeter bund walls will be constructed from overburden to a height of two metres. This is intended to prevent flood waters from entering the pit area.
- Not all of the exported sand will be washed. There is also a dry plant which will be used for the production of bedding grade sand.

The pit from which the sand will be removed will be developed in stages using strip mining methods, with completed stages being rehabilitated. Consequently, the total exposed pit area will be no more than about $0.01km^2$ at any one point in time throughout the approximately twenty years in which the site will be used. Overburden removed in stage one will be used to construct bund walls and roads. Overburden from stage two will be used to rehabilitate the completed stage one. Stockpiles of material will be located on self draining pads bound by bunded walls. This will ensure that excess water will drain to the silt traps where it can be reused.

It is our commitment of the land owners to use efficient work methods to extract and process material with minimal waste and disturbance to the surrounding area. During operations they intend to take all precautions that will minimise and where possible eliminate events that could have impacts on the environment. On completion of extraction, the area will be levelled and returned to grazing land, and any voids left will be battered and used for water storage.

Material shall be extracted from the quarry site by the use of excavators and loaders. A mobile screening and washing plant shall also be used in the processing of the material. The screening plant will be electrically driven using an onsite generator.
A plan of water usage on site can be found at ***Figure 4***.

The aim is to excavate just above the water table. This will be referred to and assessed in this report as Option 1. As it may become necessary to extract sand from below the water table, a second assessment is also required. This is referred to in this report as Option 2.

4 SUMMARY OF INVESTIGATION

4.1 A DESCRIPTION OF GROUNDWATER TABLE AND FLOW IN THE IMMEDIATE AND SURROUNDING AREA

The proposed sand extraction site is located on the alluvial material of the Fitzroy floodplains, a flat low lying region with several oxbow lakes. The ground elevation is approximately 11mAHD, with slopes of less than 5% in the area to be developed. Boreholes dug on a neighbouring site for an acid sulfate soil geotechnical investigation (which found no acid sulphate soils) revealed that the upper 3m of this area is dominated by clays, becoming clayey sands at depths of 3 to 4 mbgl. The locations of these bores and their associated bore logs can be found in the acid sulfate soil investigation report in Appendix A, in that report's ***Figure 3*** and ***Appendix A*** respectively. A borehole located on Lot 4 (111464 in ***Figure 1***) has a slightly different stratigraphic sequence, with clay present from 0.6 to 1.8mbgl and 6.9 to 7.8 mbgl, with 5.1 metres of sand lying between the clays. There may be additional undeclared bores in the surrounding area that have not been registered with DERM.

The sand intended for extraction lies below the depth of the clay material near the surface.

There is an aquifer located at a depth of approximately 8m below the ground surface. The groundwater gradient is low (suspected to be less than 0.001) and groundwater flows in an approximately southern direction rather than directly to the river to the north.

There is a well located on a neighbouring site to the east. A site visit conducted on 28th September 2010 revealed that the groundwater level in this well (at an elevation of approximately 9 mAHD) is 7.8 mbgl, or approximately 1.2 mAHD. The previous geotechnical site investigation on 29th July 2010 found groundwater levels that were 7.7 mbgl and 7.8 mbgl at points located immediately to the east of the site. Bores from the surrounding area show similar groundwater elevation data. Bore 111361 located 1.8km to the north-west had groundwater levels that were 9.1mbgl on 23rd January 2000. At an elevation of 11.3 mAHD this is a groundwater level of 2.2m AHD. Bore 99157 located 2.50km SE has comprehensive groundwater data covering the period from 1962 to 2004. In the most recent 10 years of site data, the average water level is 8.16mbgl. At a borehole elevation of approximately 10m this is approximately 1.84 mAHD.

Using near-contemporaneous groundwater data from bores 111361 and 99157, the groundwater gradient in a 5.1km line from the NW to the SE and passing directly through the site was found to be approximately 0.0001, flowing to the SE. This, together with a calculated 0.3m/day hydraulic conductivity for the sand under the flood plain, gives a groundwater velocity of 0.00003 m/day from the north-west to the south-east. This indicates that, under these hydraulic conditions, groundwater in this area is essentially not moving horizontally.

4.2 USE OF THE WATER RESULTING FROM THE EXTRACTION (IF ANY)

Option 1a – Extracting sand above the water table (use of existing abstraction bore)

There will be on site usage of water.

Water will be used to process the sand product and also to suppress dust when conditions are considered particularly dry and/or windy. Some of the water used in processing the sand and for dust suppression will be lost due to evaporation; some water will be exported off site with the sand.

John Foxlee indicates that the initial water used for washing the sand will be pumped from an onsite bore to fill the settling pond, and that this bore is only there for the initial set up, with further topping up taking place as required. The majority of water will therefore be recycled. Comparable sand mining schemes that have been subject to studies of water usage have determined that for processes of this kind the losses via evaporation in comparison to other losses are moderate.

Dust suppression will generally not be required on site. However, water trucks will be used on internal roads during particularly dry or windy conditions. Total usage of water trucks is anticipated to be very low, and hence evaporative losses from this activity should be minor

Other changes to the site that could result in changes to the groundwater regime include the effects of excavation. Removal of surface vegetation and topsoil will produce a higher rate of infiltration and consequently a higher rate of groundwater recharge. Patchy coverage of trees and shrubs is currently in place across the south and south eastern part of the site. Removal of these trees will reduce aquifer losses due to transpiration, but this may be countered by other increases in evaporative losses.

John Foxlee will excavate the site to a depth close to the groundwater table. Reducing the distance to the groundwater table can produce increased groundwater losses as evaporation from the vadose zone, (Bouwer, 1996). However, as the site operator will develop the site in stages using strip mining methods, replacing the overburden when moving onto the next stage, these additional evaporative losses will be very local and therefore small. They will be a small fraction of the losses occurring from the exposed surface water of the settling ponds.
The sand extraction rate proposed by John Foxlee is 20 000 to 30 000 tonnes per year. Assuming that the sand has the 5 to 9% moisture content typical of sand mining

operations (Geoterra, 2008) this comes to a maximum of 2700m^3/year, or 0.09L/s of groundwater exported with the product.

Accounting for evaporative losses from the site can be estimated from the area of the three settling ponds. Each settling pond will be 60x10 metres, giving a total exposed area of 1800 m^2. To account for additional minor evaporative losses from piles of damp sand, occasional dust suppression, and vadose zone losses from the pit, we will add an additional 600m^2 to this total. The nearest neighbouring Bureau of Meteorology station with pan evaporation data is Rockhampton Aero (Site number 039083), which is located 4.2km to the NE. Over the period from January 2009 to present, the maximum total monthly pan evaporation rate recorded was 275.8mm. Taking a worst case scenario in which this represents the loss every month for twelve months, this comes to 3.31m per year. Using the pre-specified 2400m^2 of exposed surface area, this produces a total volume of evaporated water of 7900m^3/year.

Combining this number with the quantity of water removed from the site as product produces a total worst case loss figure of 10,600m^3/year (29 m^3/day). This is 0.34 L/s.

To evaluate the effects this might have on the groundwater levels in adjacent areas, a simple numerical groundwater model has been constructed using Groundwater Vistas. The model is a 5km x 5km square, contains one unconfined layer representing the shallow alluvial aquifer and a pump feature has been located at the point in the site that will be used for groundwater extraction, a pre-existing bore in Lot 4 (97229).
The aquifer has been assigned parameters deemed appropriate for the materials that been sampled from the site. Hydraulic conductivity has been assigned a value 0.3m/day based on a Hazen analysis (Hazen, 1911) of a representative sample of sand from a neighbouring site. Storage parameters are taken from literature values (Johnson, 1967) for medium sand. Low values of storativity and specific yield were chosen in order to make the model more conservative. Aquifer thickness was determined from the data mentioned in Section 4.1.

No recharge from the surface was assumed, and consequently the model shows a 'worst case scenario' for the extent and magnitude of drawdown.

The model indicates that during the site lifetime (approximately 20 years), a loss of 29 m^3/day will produce a drawdown of 0.01m (1cm) at a distance of 1.488km. The closest bore to the site in the DERM database (other than the bores on the adjacent property to the west) is a bore 630m to the W, numbered 154014. At this distance, the 154014 bore would see 32cm of drawdown. The next closest bore, 136996 located 1km to the north-east would see 10cm of drawdown. This can be considered a worst case scenario.

There is a declared subartesian area located 0.29km from the abstraction bore. This is the Fitzroy Subartesian Area. Under the worst case conditions assumed by the model, the perimeter of this subartesian area would see a maximum of 110cm of drawdown after a period of 20 years.

Figure *5* shows the cone of depression following the model's 20 year run. The locations of local bores are shown and the declared subartesian area is highlighted in blue.

Sensitivity testing was carried out by varying hydraulic conductivity within the range anticipated from the material properties. A 0.05m/d reduction in hydraulic conductivity resulted in 9.5cm of drawdown at 154014. A 0.05m/d increase in hydraulic conductivity produced 12.5 cm of drawdown. These are the responses that would be expected from such a change. Changes to storage parameters were also made, and, as before, these produced changes in drawdown that were of the anticipated range. A table showing the variation in hydraulic conductivity that was performed is shown below.

Table 1 – Sensitivity testing for Option 1

Model	Hydraulic conductivity	Drawdown resulting at bore 154014 after 20 years
Standard	0.3m/d	32cm
Version 2	0.25m/d	30cm
Version 3	0.35m/d	33.5cm

What is most evident from this analysis is that while the drawdown at neighbouring abstraction wells may be minor, the drawdown at the edge of the Fitzroy Declared

Subartesian Area (110cm) is not. This may not be a significant issue, as there are no registered abstractions in this area that would see more than 10cm of drawdown.

The +1m drawdown at the edge of the Declared Subartesian Area results from the use of a pre-existing abstraction bore in Lot 4, close to the perimeter of the Declared Area. Should primary site abstraction bore be located closer to Lot 250, the drawdown that will be seen at the edge of the Declared Area will be reduced.

For this reason, another version of this model has been created, Option 1b. For Option 1b, primary abstraction well is located 40m from the edge of Lot 250 where the sand extraction will take place.

Option 1b – Extracting sand above the water table (abstraction close to Lot 250)

In this instance, the primary abstraction is located 40m from Lot 250. The model indicates after a period of 20 years, Option 1b will have a drawdown of only 20cm at bore 154014. The next closest bore, 136996 located 1.31km to the north-east would see only 2cm of drawdown. As with option 1a, this can be considered a worst case scenario.

There is a declared subartesian area located 0.65km from the abstraction bore. This is the Fitzroy Subartesian Area. Under the worst case conditions assumed by the model, the perimeter of this subartesian area would see a maximum of 31cm of drawdown at the perimeter after a period of 20 years.

Figure 6 shows the cone of depression following the model's 20 year run. The locations of local bores are shown and the declared subartesian area is highlighted in blue.

Option 2 – Extracting sand from below the water table

DERM has noted that a second analysis encompassing the possibility of extracting sand from below the top of the water table (a course of action which would require more groundwater to be pumped) would be prudent. This will be termed Option 2.

Dewatering in order to extract sand from beneath the present water table would require a short period of sustained pumping at a high flow rate in order to quickly bring about a local depression in groundwater elevation. Beyond this point, a lower rate of pumping would be necessary to sustain this depressed groundwater level. It is noted that Option 1, which represents the worst case for evaporative and transport losses for the quarry (and consequently the maximum that would need to be pumped from groundwater in such a situation) produces a suitable depression in the groundwater table below the 100x100 metre extraction pit.

To this end, another version of the model was created with a drain cell in place of the extraction bore. This drain cell was set to represent a drop in head of 2.5metres below the intial water table over an area of 100m by 100m. Taking the flow rate into this cell during the first 30 days would then give the additional flow into the cell that would be needed to produce the necessary drawdown within one month - in situations in which local recharge is not a significant factor. Any significant local recharge would result in a larger estimate for the necessary flow - however, this would be counterbalanced by the reduction in depth and extent of the cone of depression. Thus, insofar as drawdown impacts to local abstractions are concerned, a model with no recharge can be considered a worst case scenario.

Modifying the bore from Option 1 in order to incorporate the higher pumping rate ($38m^3$/day) that was demonstrated for the drain cell in the first 30 days would therefore give good estimates for the drawdown that would occur in the local area in the event of a sustained effort to dewater the upper 2.5m of the groundwater table in the 100x100m excavation area at the commencement of site operations.

Running the model for 20 years produced a worst case answer for the drawdown that would occur as a result of Option 2 being pursued.

The location of the centre of the cone of depression is naturally taken to be within the extraction area itself (Lot 250), as this is the location that will be dewatered in this scenario.

The Option 2 model shows that during the site lifetime (approximately 20 years), a loss of 29 m^3/day (with higher rate during the first 30 days of operation) will produce a drawdown of 0.01m (1cm) at a distance of 1.488km. The closest bore to the site (other than the bores on the adjacent property to the west) is a bore 800m to the NW, numbered 154014. At this distance, the 154014 bore would see no more than 19cm of drawdown. The next closest bore, 97230 located 1.3km to the south, would see 2cm of drawdown. These can be considered worst case scenarios, and the implied drawdown is minimal.

The Fitzroy Subartesian Declared Area lies 0.71km from the site. Under the worst case conditions assumed by the model, the perimeter of this subartesian area would see a maximum of 25cm of drawdown at the perimeter after a period of 20 years.

Figure *7* shows the drawdown resulting from Option 2 of the model.

As with Option 1, sensitivity testing was carried out by varying hydraulic conductivity within the range anticipated from the material properties. A 0.05m/d reduction in hydraulic conductivity resulted in 9.5cm of drawdown at 154014. A 0.05m/d increase in hydraulic conductivity produced 12.5 cm of drawdown. See table below for summary. These are the responses that would be expected from such a change.

Table 2 – Sensitivity testing for Option 2

Model	Hydraulic conductivity	Drawdown resulting at bore 154014 after 20 years
Standard	0.3m/d	19cm
Version 2	0.25m/d	17cm
Version 3	0.35m/d	20.5cm

It must be stated that owing to the non-usage of recharge, this model represents a worst case scenario for drawdown impact, but not for the volume of water abstracted. Owing to the difficulty in estimating the infiltration rate through the thick layer of clays that make up the shallow alluvial material, this has not been modelled.

4.3 EXTENT OF THE EXCAVATION DEPTH

As noted previously, John Foxlee has no intention at present of excavating beneath the groundwater table. A geotechnical survey of the local area conducted by CQ Soil Testing found the expected extraction depths will be 8 to 10 metres below surface. If dewatering does take place, the additional depth required is unlikely to exceed two metres beneath the existing water table.

4.4 MITIGATION MEASURES ON SURROUNDING GROUNDWATER RESOURCES IF ADVERSE IMPACTS OCCUR

There is a possibility with mining operations that the spillage of fuels can occur. However, as the proposed operation will not be using any on site hydrocarbon storage operations this threat is reduced, and the most probable way that such an event could occur is during the refuelling process, which carries a much smaller risk than on-site fuel storage.

Any fuel spills that might occur should be contained within the low permeability clays, reducing the risk to the aquifer.

The anticipated drawdown in groundwater levels that is expected to occur around the site as a result of extraction activities should not require mitigation measures. However, a groundwater monitoring program is prepared for each option and this is described in Section 6 below.

For both options, on-site practice should work towards minimising the losses that occur due to evaporation. For example, the settling ponds should be regularly dredged in order to reduce sediment build-up, as a deeper, narrower pond will lose less water through evaporation.

In addition, care should be taken that after each stage is completed, appropriate rehabilitation of the former stage should take place, as this will help to reduce the losses from the unsaturated zone.

5 Disposal of Excess Groundwater from Option 2

With regard to transferral of the unneeded quantities of abstracted water in the Option 2 situation, three options are possibilities; irrigation on John Foxlee's property or a neighbours, injection into the aquifer downgradient of the mining site, and discharge to surface water. The quantities involved should be sufficiently small for this issue not to require more than on-site irrigation.

The volume of groundwater which needs to be pumped to create the depressed groundwater level will require accumulation in a temporary storage facility before irrigation can occur. The calculated long term volume, without allowing for any recharge, which is required to be irrigated is 10.6ML/yr.

There is a farm dam already in place on the site which could be used for temporary storage of this excess groundwater. It is proposed that irrigation will occur using a travelling irrigator with irrigation of native pasture being undertaken. This pasture would require an average irrigation rate of 5 ML/hectare/year (Tony deVere per. comm.). The pasture grown would then be used to feed cattle kept on the property. There are in excess of 40 hectares on Lot 250 which would be suitable for irrigation. Hence, any excess groundwater extracted during sand processing will be able to be utilised for irrigation within the subject land.

In the unlikely event that excess water from the project needs to be discharged, the stored water will be treated in order to meet DERM discharge quality guidelines.

6 PROPOSED MONITORING PROGRAM FOR GROUNDWATER

Option 1 – Extracting sand above the water table

The following monitoring is proposed:

- The water level in the existing well will be monitored monthly to an accuracy of 0.01m.
- The volume of groundwater extracted from the production bore will be recorded monthly using a flow meter.
- These records will be compiled annually and submitted to DERM.

Option 2 – Extracting sand below the water table

The following monitoring is proposed:

- A minimum of three monitoring bores will be located around the boundary of the proposed works. The water level in these bores along with that in the existing well will be monitored monthly to an accuracy of 0.01m.

- The volume of water extracted from all groundwater pumping facilities will be recorded monthly using flow meters.

- The extracted groundwater quality will be monitored monthly on-site using a conductivity meter.

- These records will be compiled annually and submitted to DERM.

7 CONCLUSIONS

The proposed production bore at John Foxlee's site should only be operating on an intermittent basis to replenish the settling ponds after the initial filling of Settling Pond 3. Water losses will include evaporative losses from the system as well as water incorporated in the sand when sold from the site.

For Option 1 where sand is only extracted from above the water table, estimating the worst case impact these losses (and consequent pumping) should have after a period of twenty years results in only a very minor drawdown at the nearest neighbouring pumping bores. Drawdown at the boundary of the Fitzroy Subartesian Declared Area is dependant on the location of the pumping bore. If the bore used is 97229 (Option1a), then after a period of 20 years the drawdown at this location could be ~1.1m in the worst case scenario. If the pumping bore used is located in Lot 1 (Option 1b), the maximum possible drawdown would be ~0.3m.

Extracting sand from beneath the current water table (Option 2) should also result in only a minor drawdown in groundwater levels both at neighbouring pumping bores and at the border of the Fitzroy Subartesian Declared Area. Any excess on-site water will be able to be used through on-site irrigation.

8 LIMITATIONS

Waste Solutions Australia Pty Ltd has prepared this report for the use of John Foxlee and the Queensland Department of Environment and Resource Management in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report may not contain sufficient information for purposes other than for the client and its respective consulting advisers.

The accuracy of the assessment made in this report is dependent upon the accuracy and reliability of evidence drawn together from a number of sources. The field investigations on which this report is based were restricted to a level of detail appropriate for the current stage of the project. Waste Solutions Australia Pty Ltd has taken steps to ensure the accuracy and reliability of field observations and investigations. It is important, however, that the limitations of the assessment be clearly recognised when the findings of this study are being interpreted. This report is based on information derived partly from other parties over which Waste Solutions Australia Pty Ltd has no control.

The report is based on conditions encountered in a limited number of investigation locations. Investigations have not been conducted to characterise all possible contamination on site, nor to fulfil the purposes of all possible site developments. Conditions may be encountered in subsequent investigations or during site redevelopment, which were not encountered in this investigation.

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Prepared by:

John Cody MSc (Hydrogeo)
Hydrogeologist / Modeller

Approved by:

Paul Smith MSc (Hydrogeo) MSc (Envir Studies)
Director & Principal Consultant

FIGURES

Section owned by John Foxlee

Bore/well from DERM database

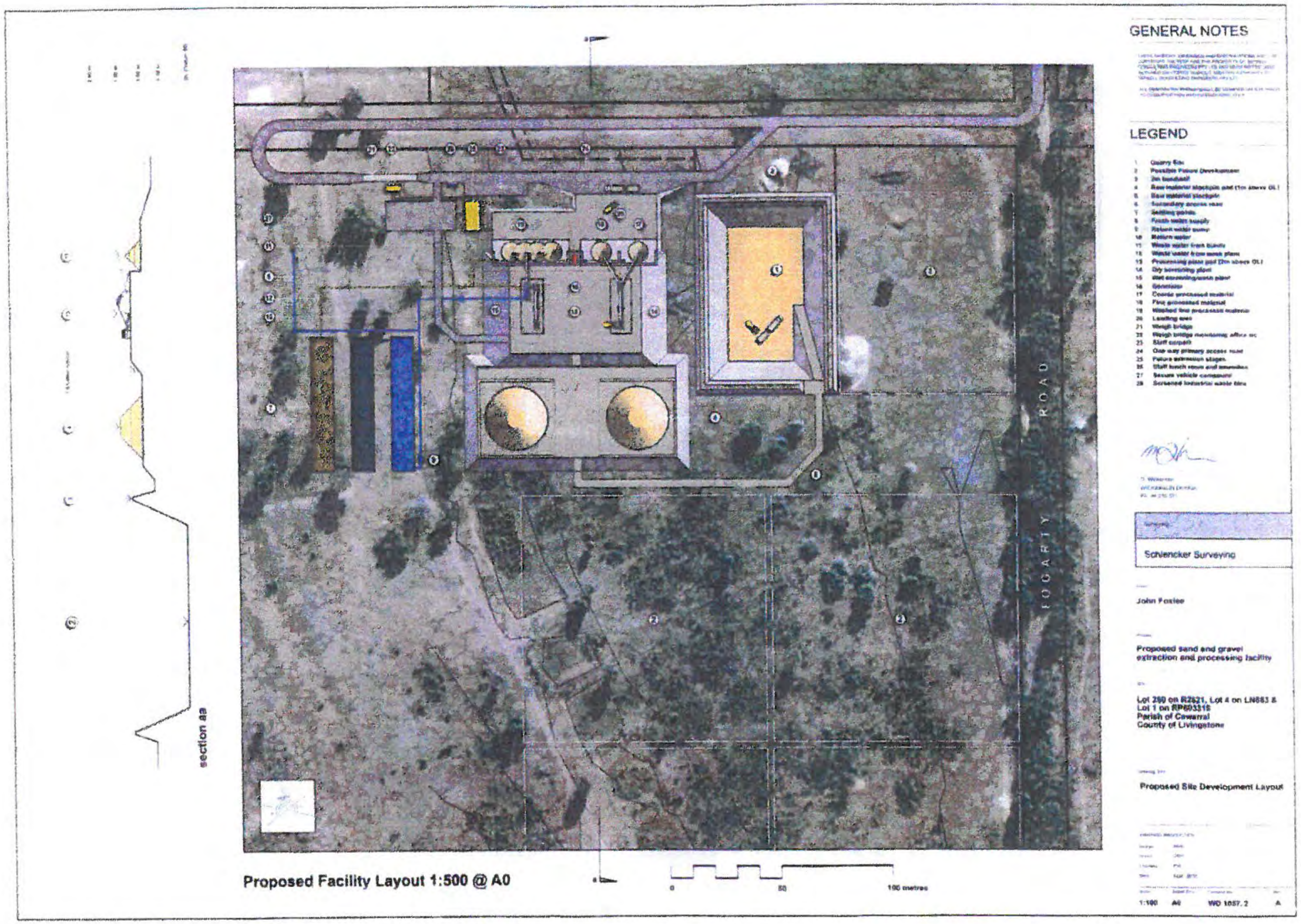
waste solutions
AUSTRALIA PTY LTD

John Foxlee

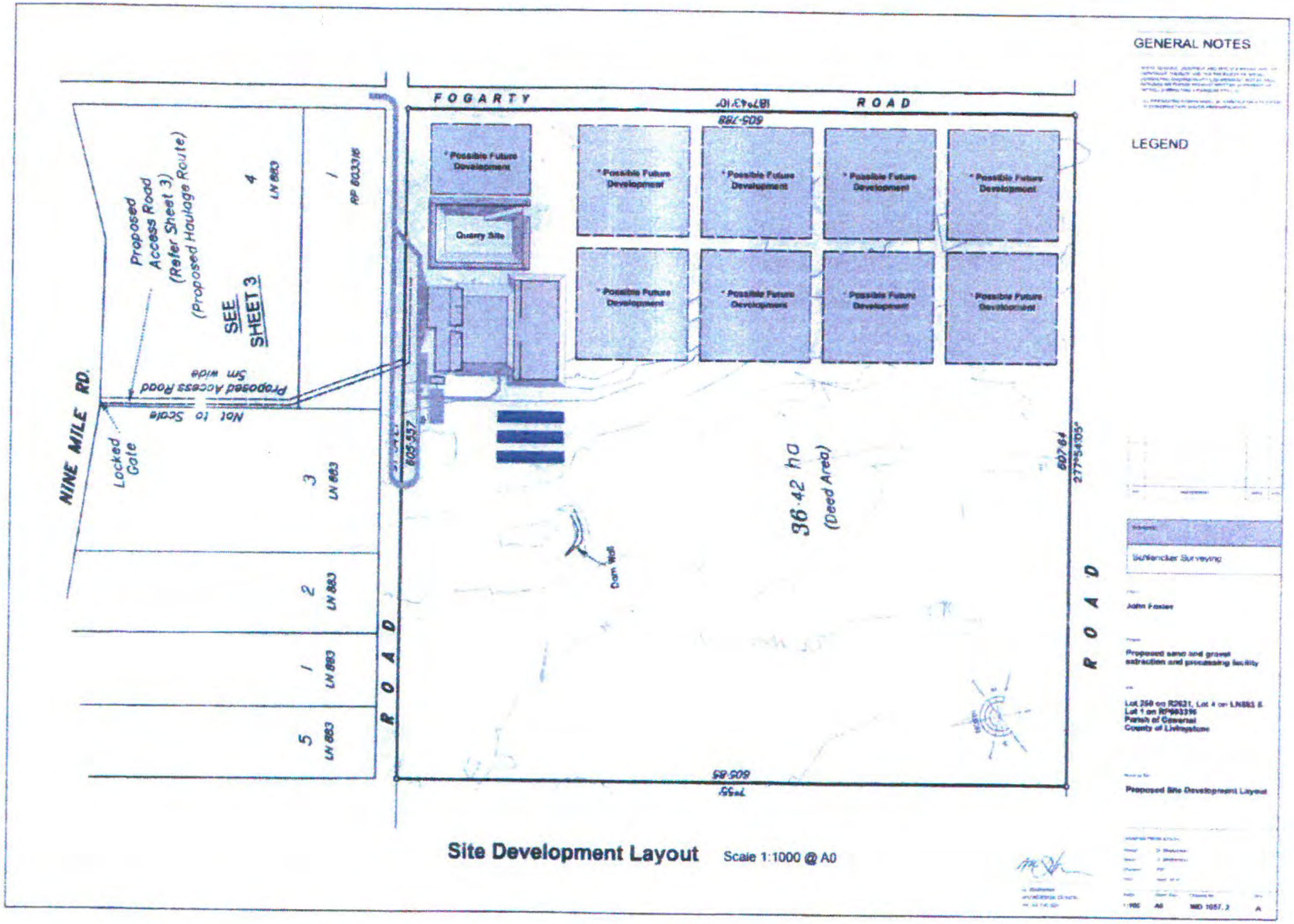
Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower

Title: Site location and property boundaries

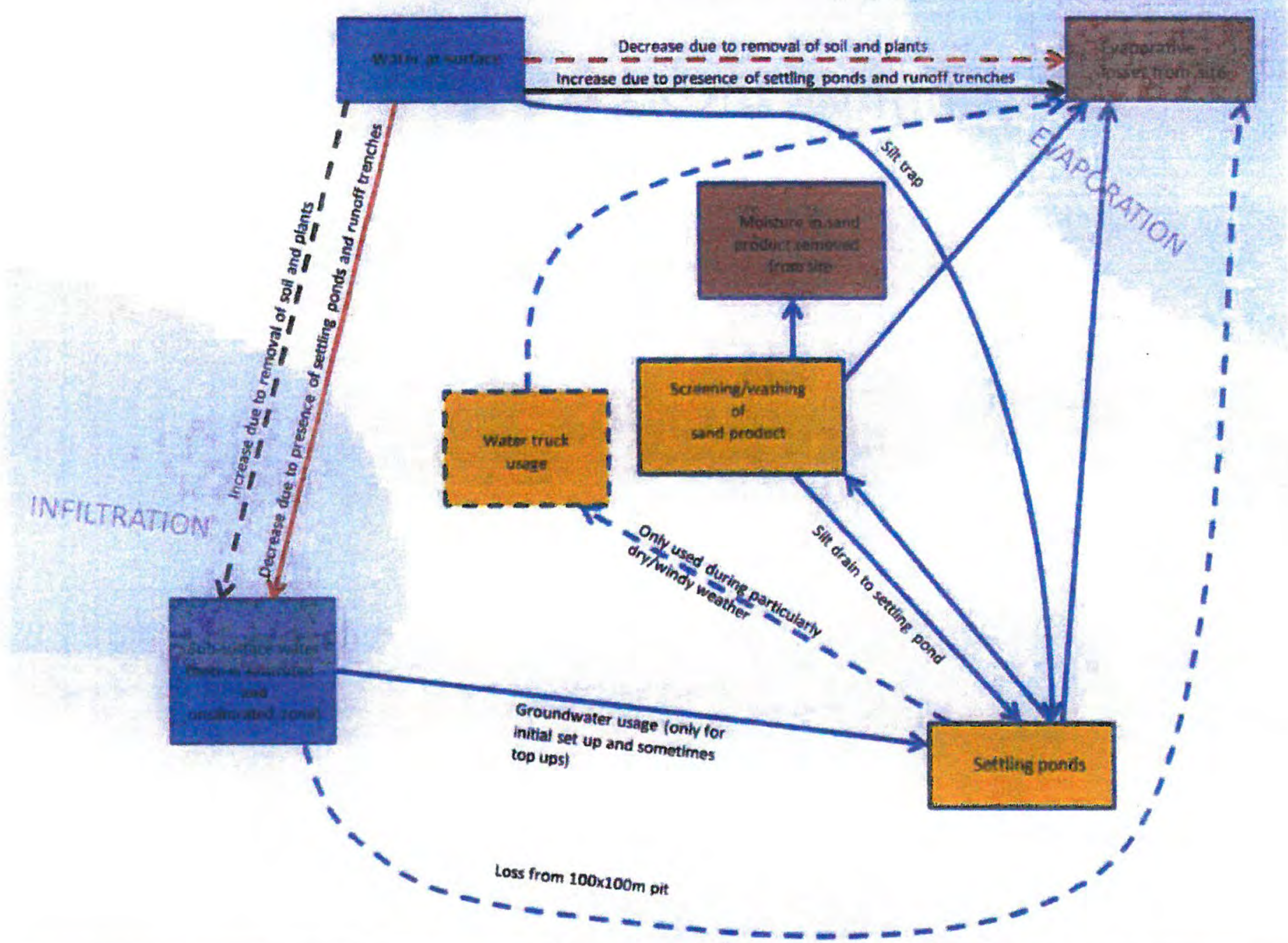
	Drawn by: JC	Approved: PS	Date: October 2010	Job no: W 565/01	Figure 1



Proposed site development plan produced by Tapsell Consulting	waste solutions AUSTRALIA PTY LTD	John Foxlee Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower Title: Proposed site plan - detail		
	Drawn by: JC	Approved: PS	Date: October 2010	Job no: W 565/02 — Figure 2

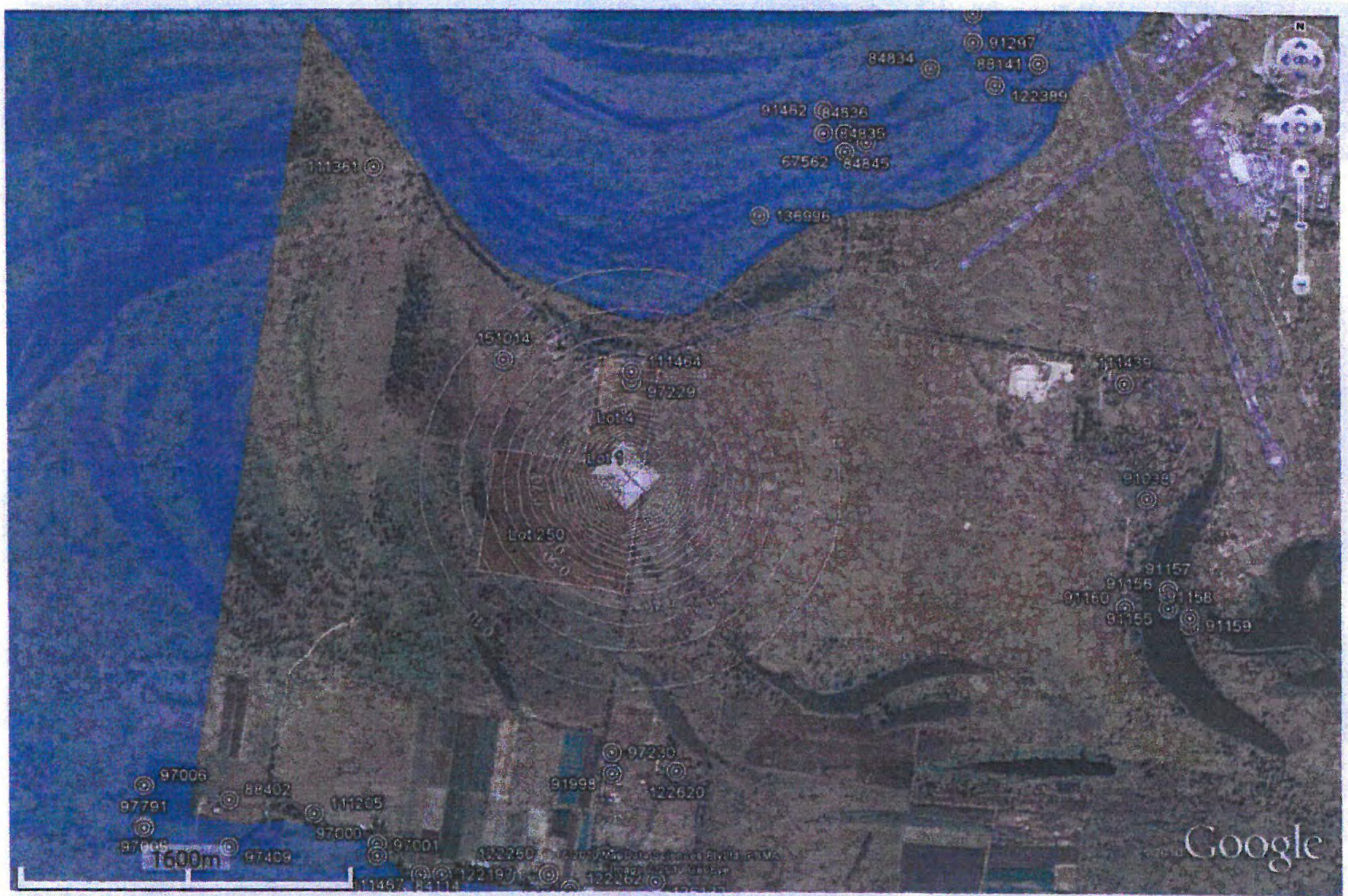


Proposed site development plan produced by Tapsell Consulting Settling ponds shown in blue	waste solutions AUSTRALIA PTY LTD		John Foxlee Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower Title: Proposed site plan - overview	
	Drawn by: JC	Approved: PS	Date: October 2010	Job no: W 565/02	Figure 3



Surface or subsurface water Losses from site Factors introduced by site development Transfer processes. Blue: new. Red: reduced by site development. Black: increased by site development. Dashed lines: minor processes/changes	waste solutions AUSTRALIA PTY LTD	John Foxlee Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower Title: Plan of on-site water usage
	Drawn by: JC | Approved: PS	Date: October 2010 | Job no: W 565/02 | Figure 4

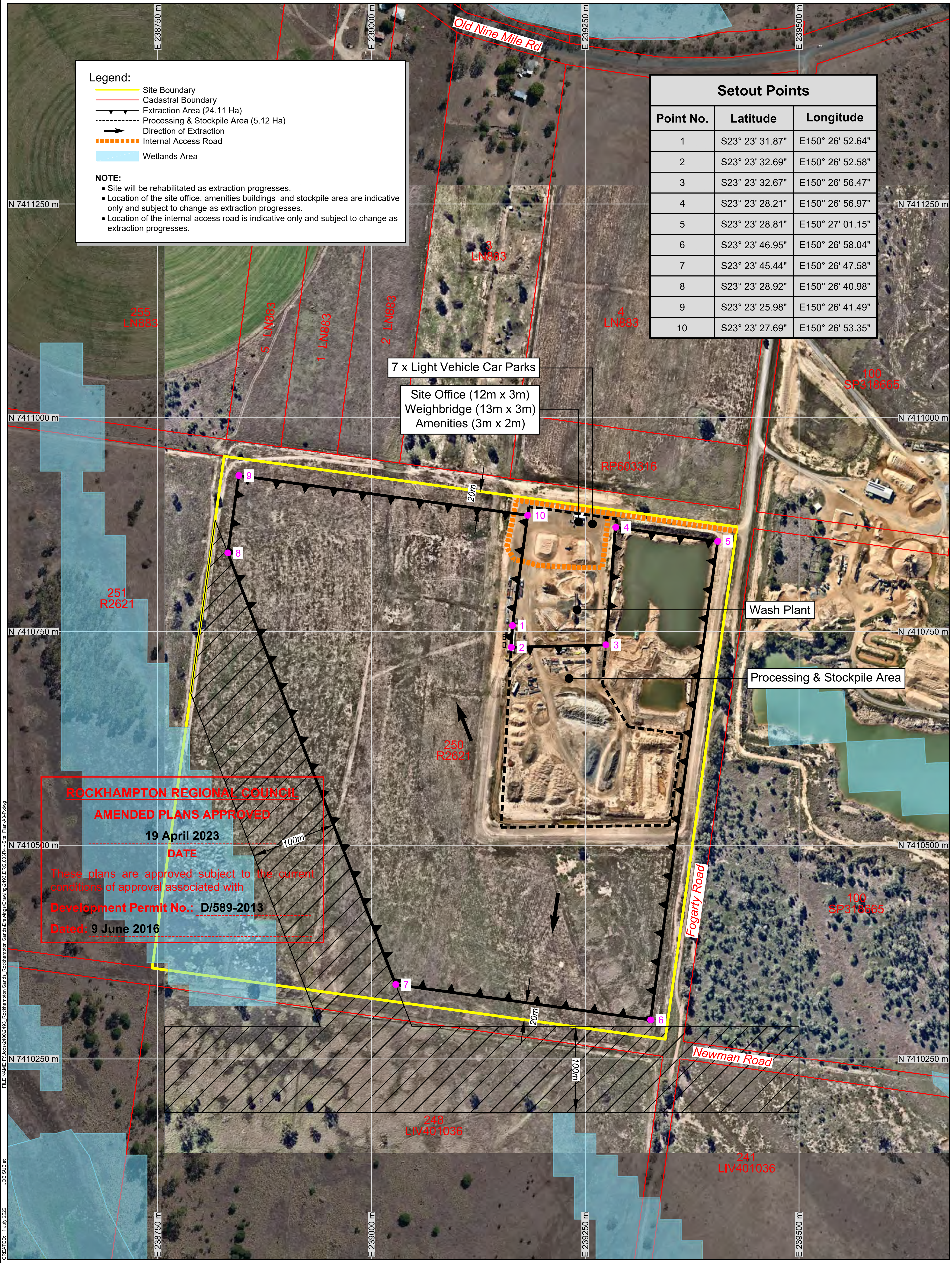
Blue areas indicate location of Fitzroy Subartesian Declared Area Concentric rings show maximum possible drawdown Drawdown values are given in metres White dots show bore locations from DERM database Centre of drawdown indicated by white diamond	waste solutions AUSTRALIA PTY LTD		John Foxlee Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower Title: Option 1a: Drawdown impact for worst case scenario, extraction remains above water table		
	Drawn by: JC	Approved: PS	Date: October 2010	Job no: W 565/01	Figure 5



Blue areas indicate location of Fitzroy Subartesian Declared Area Concentric rings show maximum possible drawdown Drawdown values are given in metres White dots show bore locations from DERM database Centre of drawdown indicated by white diamond	waste solutions AUSTRALIA PTY LTD Drawn by: JC · Approved: PS	John Foxlee Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower Title: Option 2: Drawdown impact for worst case scenario, extraction moves below water table Date: October 2010 · Job no: W 565/01 · Figure 6

Blue areas indicate location of Fitzroy Subartesian Declared Area Concentric rings show maximum possible drawdown Drawdown values are given in metres White dots show bore locations from DERM database Centre of drawdown indicated by white diamond	waste solutions AUSTRALIA PTY LTD		John Foxlee Investigation in Support of the Development Application For The Extraction of Sand off Fogarty Road, Fairy Bower Title: Option 2: Drawdown impact for worst case scenario, extraction moves below water table	
	Drawn by: JC	Approved: PS	Date: October 2010	Job no: W 565/01 · Figure 6

Note: Location of bund walls is subject to the approval of an Operational Works application for Siteworks and based on the outcome of a flood assessment in accordance with Condition 7.8



Setout Points

Point No.	Latitude	Longitude
1	S23° 23' 31.87"	E150° 26' 52.64"
2	S23° 23' 32.69"	E150° 26' 52.58"
3	S23° 23' 32.67"	E150° 26' 56.47"
4	S23° 23' 28.21"	E150° 26' 56.97"
5	S23° 23' 28.81"	E150° 27' 01.15"
6	S23° 23' 46.95"	E150° 26' 58.04"
7	S23° 23' 45.44"	E150° 26' 47.58"
8	S23° 23' 28.92"	E150° 26' 40.98"
9	S23° 23' 25.98"	E150° 26' 41.49"
10	S23° 23' 27.69"	E150° 26' 53.35"

REV	DESCRIPTION	DATE	BY
2	Extraction Cells added	08/04/2022	MR
3	Extraction areas revised	11/04/2022	MR
4	GPS setout points added	11/07/2022	MR

Data Sources:
Photography: Nearmap Imagery_Captured 2021-July-10
Topography:
Cadastre: QSC_Rockhampton Regional DCDB Extract_2021-06-27 (publication)
Ecosystem:
Other: QLD Spatial Data Catalogue

PROJECT: Rockhampton Sands Quarry

CLIENT: Nine Mile Sands Pty Ltd

TITLE: Site Layout Plan

GROUNDWORK plus
PH: +61 7 3871 0411
WWW.GROUNDWORK.COM.AU

SCALE: 1: 4,000 When Printed On A3 — 0 80m

DRAWING NUMBER: 2493.DRG.003

REVISION: 4

DATE: 11 July 2022 | DRAWN: MRescar
PRINTED: 11 July 2022 | CHECKED: SLyons

DATUM: HORIZONTAL / VERTICAL / ZONE — GDA2020 / MGA / AHD / 56

Rockhampton Sands Quarry

TRAFFIC AND PAVEMENT IMPACT ASSESSMENT REPORT

Prepared for: Nine Mile Sands Pty Ltd trading as Rockhampton Sands Pty Ltd

July 2022

File Ref:
documents / 20220705_10574_TIA

ROCKHAMPTON REGIONAL COUNCIL
AMENDED PLANS APPROVED
19 April 2023
DATE
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/589-2013
Dated: 9 June 2016

Project / Report Details

Document Title:	Traffic and Pavement Impact Assessment Report
Principal Author:	Margaret Mak
Client:	Nine Mile Sands Pty Ltd trading as Rockhampton Sands Pty Ltd
Ref. No.	20220705_10574_TIA

Document Status

Issue	*Description*	*Date*	*Author*	*Reviewer*
1	Traffic Report	01 December 2021	Margaret Mak	Bryce Trevilyan
2	Traffic Report	05 July 2022	Margaret Mak	Bryce Trevilyan RPEQ #07745

Distribution Record

Recipient	*Distribution Method*
Groundwork Plus	1e

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APPENDICES

1 Introduction

Traffic & Transport Plus (TTPlus) has been commissioned by Rockhampton Sands Pty Ltd (RS) to prepare a traffic and pavement impact assessment report as part of a development application for Rockhampton Sands Quarry located at 250 Fogarty Road, Fairy Bower, QLD, properly described as Lot 250 on R2621 (Subject Site).

The Rockhampton Sands Quarry currently enjoys an Environmental Authority (EA) that allows for haulage / extraction of up to 100,000 tonnes per annum (tpa). The proposed application seeks to temporarily increase the annual extraction volume to 1,000,000tpa to supply material to the Department of Transport and Main Roads' (DTMR) Rockhampton Ring Road Project (RRR Project). An aspect of the proposal is that once the RRR Project has been completed, the annual production rate being applied for would reduce to 250,000tpa for delivery to the general market only (Proposal).

For the purpose of this assessment, the Proposal consists of two stages being:

- Stage 1: During construction of the RRR Project, the total annual production will not exceed 1,000,000tpa, which may include up to 250,000tpa of material to the general market, and
- Stage 2: After construction of the RRR Project, the total annual production will not exceed 250,000tpa of material to the general market.

A traffic and pavement impact assessment report, dated 1 December 2021, has been prepared to assess the potential traffic and pavement impacts associated with the Proposal. Since that time, information requests have been issued:

- Queensland Government: "*SARA information request – 250 Fogarty Road, Fairy Bower*" on 27 January 2022 (SARA Information Request); and
- Rockhampton Regional Council (Council): "*Amended information request – Development application D/589-2013 for 'Other change' to a material change of use for extractive industry (extension) – Situated at Lot 250 Fogarty Road, Fairy Bower – Described as Lot 250 on R2621"* on 12 January 2022 (Council Information Request).

This updated traffic and pavement impact assessment report has been prepared to address the traffic, pavement and road safety request items included in the SARA Information Request and Council Information Request.

The precise timing of the construction phase of the RRR Project (for the section near the Subject Site) is likely to vary. For the purpose of this traffic and pavement impact assessment, it is assumed that Stage 1 of the Proposal would commence operation in 2022, produce up to 1,000,000tpa until the end of 2024 and produce up to 250,000tpa from 2025 onwards in Stage 2 of the Proposal. However, it is important that both Council and DTMR recognise that the construction date for the RRR Project is not yet confirmed, and therefore, the exact duration of Stage 1 is unknown. Therefore, any conditions imposed by Council and DTMR for Stage 1 will need to allow for flexibility at the start, end, and for the duration of delivery of material to the RRR Project.

An assessment of the operational impacts of Stage 1 and Stage 2 of the Proposal on the external road network has been undertaken using SIDRA 9 intersection analysis software (SIDRA). As part of the SIDRA analysis, the assessment philosophy has included the concept of a "peak hour factor" (more information provided in Section 4.4), to provide additional surety that suitable infrastructure is in place at commencement of, and through the life of the Proposal, to cater for the likely 'worst–case–scenario' peak operating conditions of the Proposal. This methodology is considered to be a suitably conservative approach to the analysis.

This report addresses the following traffic–related issues:

- Transport routes to the RRR Project and the general market;
- Additional trips (both heavy and light vehicles) associated with the Proposal during Stage 1 and Stage 2;
- Area of potentially 'significant' traffic impact;
- Traffic impacts on the adjacent external road network associated with the Proposal;
- Safety issues on the adjacent external road network in consideration of the additional traffic generated by the Proposal, and
- Pavement impacts and the potential need for contributions related to pavement impacts associated with the Proposal.

A summary of findings is provided in Section 9 of this report.

2 Subject Site

2.1 Site Location and Site Layout Plan

The Subject Site is located approximately 0.55km south of the Nine Mile Road / Fogarty Road intersection. Figure 2–1 illustrates the location of the site relative to Fogarty Road, Nine Mile Road and Ridgelands Road.

The additional trips that would be generated by the Proposal would use the existing site access on Fogarty Road (demonstrated by the purple cross on Figure 2–1).

The site layout plan for the Proposal is included as Appendix A.

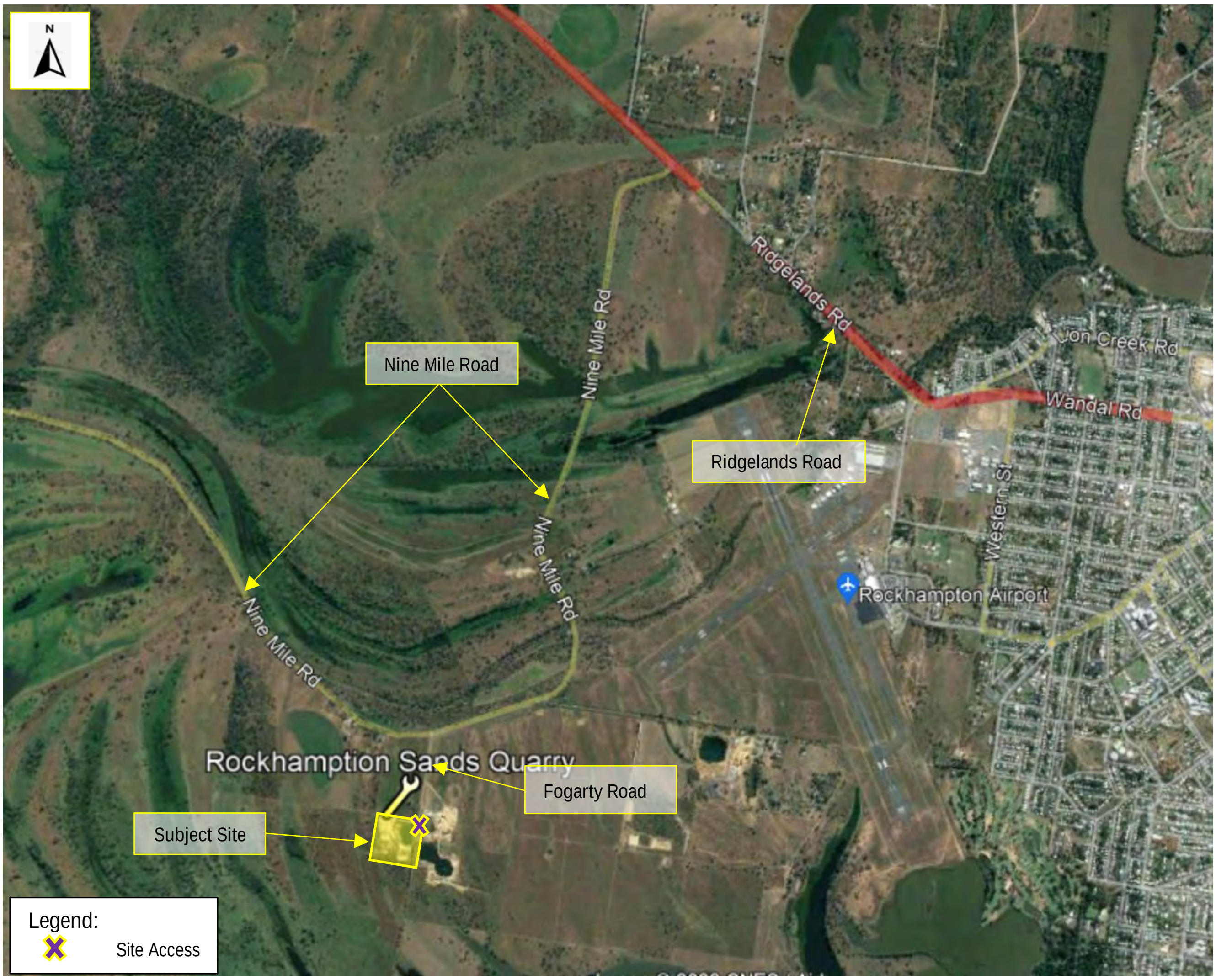

Figure 2–1 – Locality Map

Source: Google Earth [annotations and road names added by TTPlus]

Note: The red shaded lines indicate State controlled roads.

2.2 Existing Road Network

The hierarchical classification and characteristics of the roads in the vicinity of the Subject Site are described in Table 2–1 below.

Table 2–1 – Existing Road Hierarchy

Road	Description	Authority	Speed Limit
Fogarty Road	2 lane carriageway between the site access and Nine Mile Road	Council***	100km/h*
Nine Mile Road	2 lane sealed carriageway	Council	80km/h**
Ridgelands Road	2 lane sealed carriageway	DTMR	100km/h**

**It is assumed that Fogarty Road has a speed limit of 100km/h as there is no posted speed limit (the speed limit outside of built-up areas in Queensland is 100km/h unless otherwise indicated by signs).*

***Speed limits have been identified using Google Maps streetwiew and confirmed by the independent traffic survey company engaged to undertake the traffic surveys completed in conjunction with this project.*

**** It is noted that Fogarty Road is not a council-maintained road. A signage on Fogarty Road, located near the Nine Mile Road / Fogarty Road intersection, indicates "End Council Maintained Road" (refer to Photo 2–1). It is currently maintained by quarry operators that utilising Fogarty Road.*

Photo 2–1 – Signage on Fogarty Road
[annotations added by TTPlus]

3 The Transport Routes

During Stage 1 the Proposal seeks to supply up to 1,000,000tpa of material to the RRR Project, with a maximum of 250,000tpa supplied to the general market (the total annual production will not exceed 1,000,000tpa). In this assessment it is assumed that Stage 1 would function for 2 years, nominally until 2024. During Stage 2 (nominally from 2025 onwards), the Proposal would supply up to 250,000tpa of material to the general market.

The existing approved transport route related to the Subject Site is Fogarty Road, Nine Mile Road and Ridgelands Road (illustrated by the blue dotted lines on Figure 3–1) – this existing approved transport route would be continued to be utilised by the Proposal.

Figure 3–1 illustrates the location of the site relative to the alignment of the RRR.

RS and Groundwork Plus attended a meeting with SARA and DTMR (officers of the RRR Project) on 3 March 2022. As an output from these discussions with DTMR, RS confirms that the quarry would only supply material to the RRR Project, south of the Fitzroy River. TTPlus has been advised that the delivery of material to the RRR Project would be made near Point 3 on Nine Mile Road, and near Point 4 and Point 6 on Ridgelands Road (as illustrated on Figure 3–1) where the RRR Project alignment intersects with the existing road network. The proposed transport route to the RRR Project is Fogarty Road, Nine Mile Road and Ridgelands Road, which has been illustrated by the pink dotted line on Figure 3–1. Should the Proposal be approved, suitable conditions could be included to outline the permitted transport routes for the RRR Project.

It is noted that the Rockhampton Sands Quarry is one of the closest quarries to the RRR project. Nine Mile Road and Ridgelands Road are likely to be utilised by trucks delivering material to the RRR Project whether or not the material is supplied from the Subject Site or from another quarries, but likely from quarries further away (longer transport routes).

The vehicles sought to be used by the Proposal for haulage are a mixture of trucks, semi-trailers, truck and dogs and B-doubles (note: the design vehicle is a B-double).

The portion of Ridgelands Road included in the proposed transport routes outlined above (and demonstrated on Figure 3–1) is suitable for vehicles up to B-doubles. As such, the proposed transport routes are appropriate for typical haulage vehicles associated with the Proposal. An image of the multi combination routes map, indicating the location of the Subject Site, is duplicated on Figure 3–2.

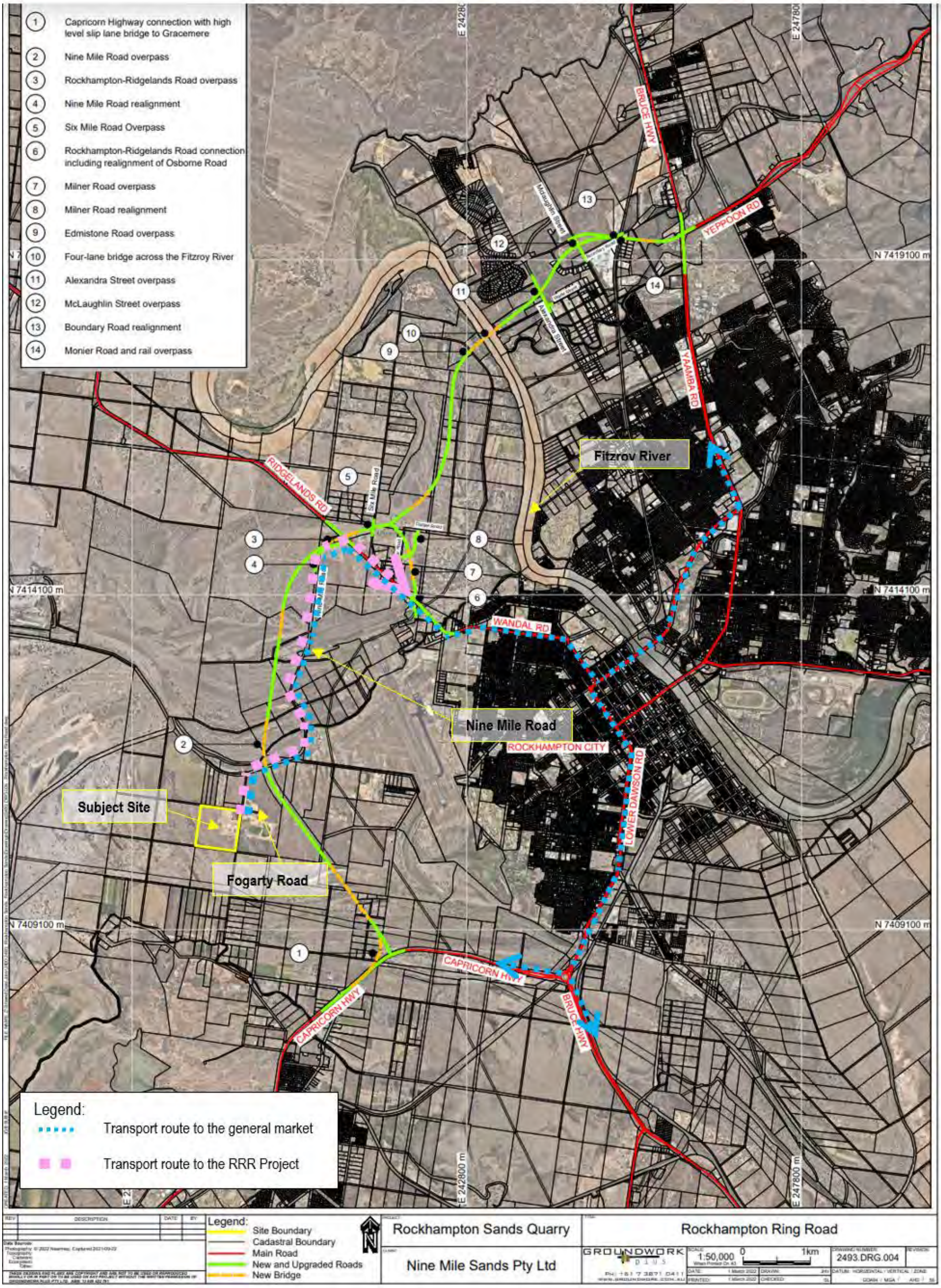

Figure 3–1 – Transport Routes and Alignment of RRR Project
Source: Google Earth [annotations added by TTPlus]

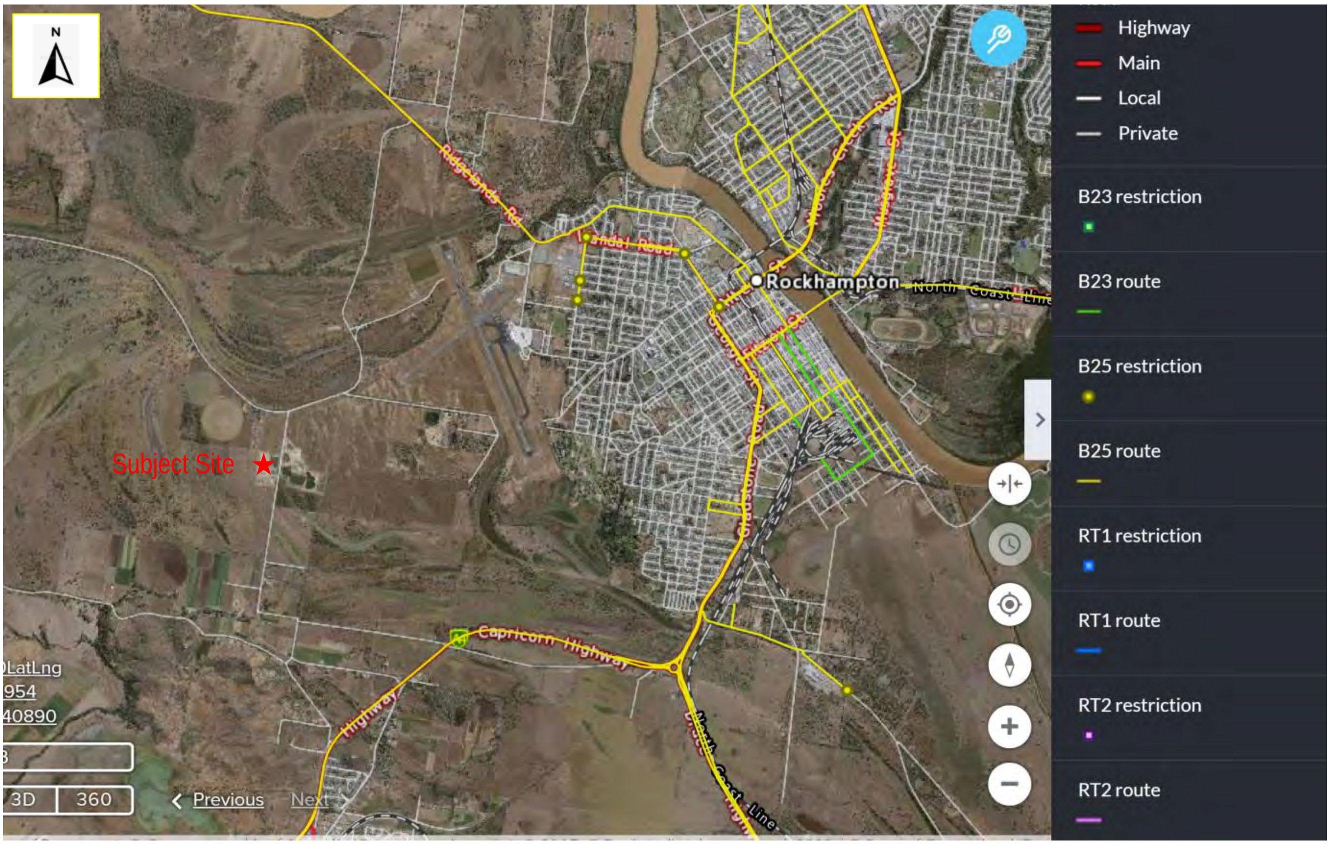

Figure 3–2 – Multi Combination Routes Map (DTMR)
(annotations added by TTPlus)
Source: https://qldglobe.information.qld.gov.au/?topic=heavy-vehicle-routes-and-restrictions

4 Traffic Volumes

4.1 Area of Potentially 'Significant' Traffic Impact

DTMR's "*Guide to Traffic Impact Assessment*" (GTIA) (Ref.1) states that "*Impact assessment area (road link capacity) – All road links where the development traffic exceeds 5% of the base traffic in either direction on the link's annual average daily traffic (AADT) in the year of opening of each stage.*"

For the purpose of considering this threshold, or zone of influence, the daily trips generated by Stage 1 of the Proposal (the more critical stage of the Proposal) have been compared to the 2020 background traffic volumes on the road network in the vicinity of the Subject Site.

For the purpose of this traffic and pavement impact assessment, it is assumed that in Stage 1 the Proposal would produce up to 1,000,000tpa until 2024 (conservatively assumed to comprise a supply of up to 250,000tpa of material to the general market and up to 750,000tpa of material to the RRR Project [in that delivery to the RRR Project is less impactful]). From 2025 onwards, Stage 2 of the Proposal has been modelled to supply up to 250,000tpa of material to the general market.

TTPlus has been advised that the delivery of material to the RRR Project would be made near Point 3, Point 4 and Point 6 (as illustrated on Figure 3–1) where the RRR Project alignment intersects with the existing road network. Within the modelling outlined herein, it has been conservatively assumed that all delivery of material to the RRR Project would be made via Point 6 on Ridgelands Road (as illustrated on Figure 3–1), being the furthest potential delivery point from the Subject Site. Therefore, the area of potentially 'significant' traffic impact associated with the Proposal for material hauled to the RRR Project would be up to Point 6 (as illustrated on Figure 3–1).

The area of potentially 'significant' traffic impact associated with the Proposal (Stage 1 and Stage 2) for material hauled to the general market would be determined as follows.

TTPlus has been advised that the operational hours of the haulage activities of the existing quarry and that of the Proposal are from 6:00am to 6:00pm (12 hours per day) from Monday to Saturday. In this latest Proposal, no haulage activities are proposed to be undertaken on Sunday.

The estimated daily trip generation associated with the Proposal to the general market is outlined below.

- Maximum annual production rate to the general market: 250,000tpa;
- Operational weeks per year: 52 weeks;
- Average operational days per week: 6 days per week;
- Average mass of material per vehicle*: 33.32 tonnes per vehicle;
- Average daily traffic volume (IN): 250,000 / 52 / 6 / 33.32 = 24.05 → 24vpd, and
- Average daily traffic volume (OUT): 24vpd (assumed same as IN traffic volumes).

**TTPlus has been advised that 13.0t payload truck (4%), 26.5t payload semi trailer (32%), 40.0t payload B-double (32%) and 36.0t payload truck and dog (32%) would be used for haulage to the general market. The average mass of material assumed to be transported per vehicle has been calculated by factoring the mass of material able to be transported by these vehicles and the relative proportions of them within the vehicle fleet. Therefore, the average mass of material per vehicle = 13.0t x 0.04 + 26.5t x 0.32 + 40.0t x 0.32 + 36.0t x 0.32 = 33.32 tonnes per vehicle.*

TTPlus has been advised that there would be an additional 2 staff working at the site as compared to existing operations (an increase from 7 staff to 9 staff). It is likely that the additional staff and visitors would generate less than 50vpd – this is the allowance made for these trips within the modelling.

On this basis of the above assumptions, the modelled design level daily trip generation associated with the Proposal (general market) is 98vpd (= 24 + 24 + 50).

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[1] "Guide to Traffic Impact Assessment", DTMR, 2017.

The annual average daily traffic (AADT) of Ridgelands Road (station no. 60112), east of Nine Mile Road was 2,892vpd in 2020. Therefore, the Proposal, for material hauled to the general market, would only generate a ~3.4% increase in daily traffic above background levels (= 98 / 2,892) (< 5% increase); accordingly the Proposal (for material hauled to both the RRR Project and the general market) would not have a significant traffic impact on the external (State and Council) road network beyond Point 6 on Ridgelands Road (as illustrated on Figure 3–1) as no RRR-related haulage would occur beyond Point 6.

The years beyond 2020 would yield a lower percentage increase in traffic volumes related to the Proposal (due to background traffic growth), and therefore the relative impacts associated with the Proposal would reduce overtime – accordingly assessment of those years after 2020 would also yield an impact of the Proposal at a level that would be considered to be insignificant on the road network outside of the identified zone of influence for the life of the Proposal.

Therefore consideration of the appropriate GTIA-defined 'Impact Assessment Area' yields the requirement to assess the operational performance of the Fogarty Road Site Access intersection, the Nine Mile Road / Fogarty Road intersection and the Nine Mile Road / Ridgelands Road intersection. These intersections have been assessed, and the findings of that assessment outlined within this report in order to fully quantify the potential impacts on the external road network.

4.2 2021 Traffic Volumes

To assist in the preparation of this assessment, determination of the existing background traffic volumes is required. Traffic surveys were undertaken at the Fogarty Road Site Access intersection, the Nine Mile Road / Fogarty Road intersection and the Nine Mile Road / Ridgelands Road intersection on Friday 13 August 2021 from 6:30am to 9:30am and from 2:30pm to 6:00pm. The locations of the traffic surveys are illustrated on Figure 4–1.

The detailed results of the traffic surveys are included in Appendix D.

Figure 4–1 – Locations of Traffic Surveys
Source: Google Earth [annotations added by TTPlus]
Note: The red shaded lines indicate State controlled roads.

The observed AM and PM peak hour periods identified were as follows:

- the Fogarty Road / Site Access intersection:
  - 6:30am to 7:30am and 4:30pm to 5:30pm
- the Nine Mile Road / Fogarty Road intersection:
  - 7:30am to 8:30am and 3:00pm to 4:00pm
- the Nine Mile Road / Ridgelands Road intersection:
  - 7:30am to 8:30am and 3:00pm to 4:00pm

The peak hour volumes observed at each individual intersection have been adopted in this assessment – this is a somewhat conservative approach. Figure B1 within Appendix B illustrates the 2021 Observed AM and PM peak hour traffic volumes.

4.3 Base Traffic Volumes

As identified in Section 4.1 of this report, the Proposal for material hauled to the general market would not have a significant traffic impact on the external road network beyond Point 6 on Ridgelands Road (as illustrated on Figure 3–1).

Background traffic data was sourced from DTMR traffic census stations along Ridgelands Road to assist in forecasting an appropriate background traffic growth rate to utilise for assessment purposes. The AADT and growth rates of the nearby State controlled roads (SCRs) are listed below:

- Ridgelands Road (station no. 60034), west of Nine Mile Road:
  - From 1,573 vehicles per day (vpd) in 2010 to 1,557vpd in 2020
  - Growth rate: -0.1% p.a. (compound)
- Ridgelands Road (station no. 60112), east of Nine Mile Road:
  - From 3,172vpd in 2010 to 2,892vpd in 2020
  - Growth rate: -0.9% p.a. (compound)

Whilst future traffic growth can only be estimated, for the purpose of this assessment, despite a slight reduction in historical traffic volumes on the road network, a traffic growth rate of 1% p.a. (compound) has been adopted to estimate the future background traffic volumes on SCRs near the Subject Site.

Figures B2 and B3 within Appendix B illustrate the Base AM and PM peak hour traffic volumes (without the Proposal) in 2024 (the last operational year of Stage 1) and 2032 (10-year design horizon of the Proposal) utilised in the assessment outlined herein.

4.4 Hourly Trip Generating Characteristics of the Proposal

Truck Trips – to / from the general market

In order to ensure that sufficient infrastructure is in place to cater for the 'worst–case' operational scenario, the analysis has conservatively assumed that the Proposal would be likely to generate more than the typical hourly traffic volumes during the peak hour periods by introducing the concept of a "peak hour factor". In this instance, a peak hour factor of 3 has been adopted – refer to second footnote below which outlines the details of the "peak hour factor".

The Rockhampton Sands Quarry currently enjoys an EA that allows for haulage / extraction of up to 100,000tpa to the general market. The trips generated by the existing quarry (100,000tpa) are included in the results of traffic surveys. As previously identified, for the purpose of this assessment, it is assumed that the production of the quarry to the general market would increase from 100,000tpa to 250,000tpa (an increase of 150,000tpa). The estimated additional trip generation associated with the Proposal for material hauled to the general market is outlined below.

- Additional annual production rate to the general market: 150,000tpa;
- Operational weeks per year: 52 weeks;
- Typical operational hours per day: 12 hours;
- Average operational days per week: 6 days per week;
- Average mass of material per vehicle*: 33.32 tonnes per vehicle;
- Peak hour factor**: 3;
- Average daily traffic volume (IN): 150,000 / 52 / 6 / 33.32 = 14.5 → 15vpd;
- Average daily traffic volume (OUT): 15vpd (assumed same as IN traffic volumes);
- Peak hour traffic volume (IN): 150,000 / 52 / 6 / 12 / 33.32 × 3= 3.6 → 4vph, and
- Peak hour traffic volume (OUT): 4vph (assumed same as IN traffic volumes).

**TTPlus has been advised that 13.0t payload truck (4%), 26.5t payload semi trailer (32%), 40t.0 payload B-double (32%) and 36.0t payload truck and dog (32%) would be used for haulage to the general market. The average mass of material assumed to be transported per vehicle has been calculated by factoring the mass of material able to be transported by these vehicles and the relative proportions of them within the vehicle fleet. Therefore, the average mass of material per vehicle = 13.0t x 0.04 + 26.5t x 0.32 + 40.0t x 0.32 + 36.0t x 0.32 = 33.32 tonnes per vehicle.*
***The peak hour factor is the ratio of the absolute peak operating conditions to the average operating conditions of the critical year, as modelled for the Proposal delivering material to the general market. This represents what is considered to be the 'worst–case' peak operational scenario and accounts for all design-level aspects of variations expected throughout each day for the hauling activities to the general market. The above calculation is based on the assumption of the maximum supply to the general market being 250,000tpa.*

<u>Truck Trips – to / from the RRR Project</u>

For the purpose of this assessment, it is conservatively assumed that 750,000tpa of material would be supplied to the RRR Project. The estimated trip generation associated with the Proposal to the RRR Project is outlined below.

- Annual production rate to the RRR Project up to 2024: 750,000tpa;
- Operational weeks per year: 52 weeks;
- Typical operational hours per day: 12 hours;
- Average operational days per week: 6 days per week;
- Average mass of material per vehicle*: 31.50 tonnes per vehicle;
- Peak hour factor**: 3;
- Average daily traffic volume (IN): 750,000 / 52 / 6 / 31.50 = 76.3 → 76vpd;
- Average daily traffic volume (OUT): 76vpd (assumed same as IN traffic volumes);
- Peak hour traffic volume (IN): 750,000 / 52 / 6 / 31.50 / 12 × 3 = 19.08 → 19vph, and
- Peak hour traffic volume (OUT): 19vph (assumed same as IN traffic volumes).

**TTPlus has been advised that 13.0t payload truck (3%), 26.5t payload semi trailer (50%), 40.0t payload B-double (23.5%) and 36.0t payload truck and dog (23.5%) would be used for haulage to the RRR Project. The average mass of material assumed to be transported per vehicle has been calculated by factoring the mass of material able to be transported by these vehicles and the relative proportions of them within the vehicle fleet. Therefore, the average mass of material per vehicle = 13.0t x 0.03 + 26.5t x 0.50 + 40.0t x 0.235 + 36.0t x 0.235 = 31.50 tonnes per vehicle.*
***The peak hour factor adopted for the RRR Project is again 3.*

These resultant volume forecasts are appropriately conservative for the purpose of this assessment. It is also conservatively assumed within the modelling that the development peak and the on–road peak are coincident, and that the 'peak hour factor' levels of design operation of both the general market haulage and RRR Project haulage coincide.

This 'worst–case' operational scenario is a design consideration only and is unlikely to occur as part of the actual day to day operations. The analysis methodology used is intended to ensure that sufficient infrastructure is provided in the vicinity of the site and to enable the safe and efficient operation of the surrounding road network.

<u>Car Trips</u>

TTPlus has been advised that there would be an additional 2 staff working at the site (an increase from 7 staff to 9 staff) associated with both Stage 1 and Stage 2 of the Proposal as compared to existing operations.

Staff and visitors would generally not arrive / leave the site during the AM and PM haulage peak periods; notwithstanding this, allowances of additional 2vph (1vph IN + 1vph OUT) during both the AM and PM peak hour periods have been included in the analysis. The allowance for additional trips generated by staff and visitors (car trips) is in addition to the additional trips generated by the haulage activities (truck trips) of the Proposal. The travel routes of staff / visitors are not known at this stage, however, for the purpose of this assessment, it has been assumed that all the staff would travel to / from the site from / to Rockhampton.

Trip Distribution

TTPlus has been advised that materials to the general market are anticipated to be transported towards Rockhampton town centre and to the Bruce Highway (north and south) via the existing approved transport route discussed and outlined in Section 3 of this report. The proposed transport route to the RRR Project is Fogarty Road, Nine Mile Road and Ridgelands Road (up to Point 6 on Ridgelands Road (as illustrated on Figure 3–1)).

The additional trips forecast to be generated by the Proposal are illustrated on Figure B4 (truck trips to the general market), Figure B5 (truck trips to the RRR Project) and Figure B6 (car trips) within Appendix B.

4.5 Design Traffic Volumes

For the reasons outlined earlier in this report, the resultant traffic volume forecasts are considered to be appropriately conservative for the purpose of this assessment. It is also conservatively assumed within the modelling that the development peak and the on–road peak hours coincide.

The 2024 Design peak hour traffic volumes [Figure B7] = 2024 Base peak hour traffic volumes [Figure B2] + Additional truck trips to the general market [Figure B4] + Additional truck trips to the RRR Project [Figure B5] + Additional car trips [Figure B6].

The 2032 Design peak hour traffic volumes [Figure B8] = 2032 Base peak hour traffic volumes [Figure B3] + Additional truck trips to the general market [Figure B4] + Additional car trips [Figure B6].

5 Traffic Impact Assessment

Future operation of the Fogarty Road Site Access intersection, the Nine Mile Road / Fogarty Road intersection and the Nine Mile Road / Ridgelands Road intersection have been assessed. The following sections of this report outline the results of the analyses of these key intersections. The detailed results of the SIDRA analyses for these key intersections are provided as Appendix C.

DTMR's GTIA (Ref.1) states that "*For intersections assessed within the impact assessment area, TMR considers it unreasonable to require the mitigation of impacts where the development increases average delay to base traffic movement by less than 5% in aggregate. Accordingly, a significant worsening to an intersection is where the average delay to base traffic movements is greater than 5% in aggregate.*"

The Nine Mile Road / Ridgelands Road intersection is a State controlled intersection. Therefore the increases in the average delay to the base traffic movements have been assessed at the Nine Mile Road / Ridgelands Road intersection. In this instance, the assessment has been completed for the design horizon years of relevance.

For the Fogarty Road Site Access intersection, the Nine Mile Road / Fogarty Road intersection (Council controlled intersections), the modelled degrees of saturation (DOSs) have been compared against the practical maximum DOS to test whether satisfactory operating conditions would exist.

5.1 Intersection Performance of the Fogarty Road Site Access Intersection

The Proposal would continue to use the existing site access on Fogarty Road, which is approximately 0.55km south of the Nine Mile Road / Fogarty Road intersection. The existing configuration of the Fogarty Road Site Access intersection, as assessed using SIDRA, is shown as Figure 5–1.

It is noted that the road width of Fogarty Road south of the site access reduces, however the observed hourly traffic volumes on the southern section of Fogarty Road were less than 5vph and the additional trips generated by the Proposal would be to / from Fogarty Road (north); accordingly, the cross-section of Fogarty Road south of the site access is not of relevance to the Proposal.

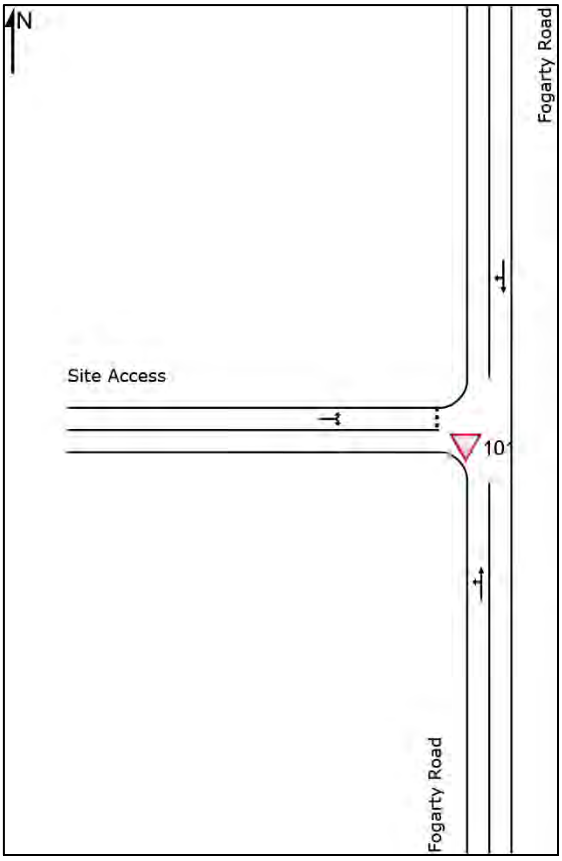

Figure 5–1 – Existing Configuration of the Fogarty Road Site Access Intersection

Results from the analyses of the Fogarty Road Site Access intersection for the base and design scenarios with the Proposal in 2024 (last operational year of Stage 1) and in 2032 (10-year design horizon of the Proposal – excludes haulage to the RRR Project) are summarised in Table 5-1 and Table 5-2.

Table 5–1 – 2024 Operational Characteristics of the Fogarty Road Site Access Intersection

Leg	Movement	2024 Base (without the Proposal)				2024 Design (with the Proposal (Stage 1))			
		AM		PM		AM		PM	
		DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)
Fogarty Road (South)	L	0.01	0	0.01	0	0.01	0	0.01	0
	T	0.01	0	0.01	0	0.01	0	0.01	0
Fogarty Road (North)	T	0.01	0	0.01	0	0.02	1	0.03	1
	R	0.01	0	0.01	0	0.02	1	0.03	1
Site Access (West)	L	0.01	0	0.01	0	0.03	1	0.03	1
	R	0.01	0	0.01	0	0.03	1	0.03	1

Note: Practical Maximum DOS for a priority intersection is 0.80.

Table 5–2 – 2032 Operational Characteristics of the Fogarty Road Site Access Intersection

Leg	Movement	2032 Base (without the Proposal)				2032 Design (with the Proposal (Stage 2 excluding RRR Project))			
		AM		PM		AM		PM	
		DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)
Fogarty Road (South)	L	0.01	0	0.01	0	0.01	0	0.01	0
	T	0.01	0	0.01	0	0.01	0	0.01	0
Fogarty Road (North)	T	0.01	0	0.01	0	0.01	0	0.01	0
	R	0.01	0	0.01	0	0.01	0	0.01	0
Site Access (West)	L	0.01	0	0.01	0	0.01	0	0.01	0
	R	0.01	0	0.01	0	0.01	0	0.01	0

Note: Practical Maximum DOS for a priority intersection is 0.80.

The results provided in Table 5-1 and Table 5-2 indicate that the Fogarty Road Site Access intersection, as assessed, would operate well within satisfactory operating parameters in 2024 with Stage 1 of the Proposal and in 2032 with Stage 2 of the Proposal, from a capacity viewpoint.

5.2 Intersection Performance of the Nine Mile Road / Fogarty Road Intersection

The modelled existing configuration of the Nine Mile Road / Fogarty Road intersection, as assessed using SIDRA, is shown as Figure 5–2.

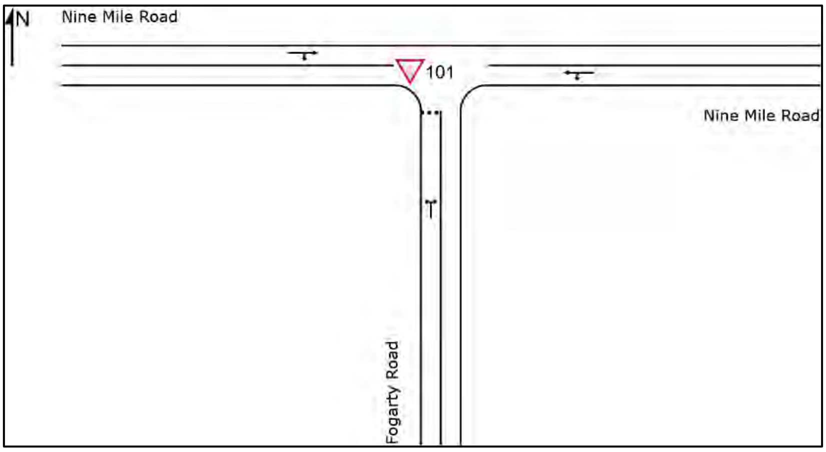

Figure 5–2 – Modelled Existing Configuration of the Nine Mile Road / Fogarty Road Intersection

Results from the analyses of the Nine Mile Road / Fogarty Road intersection for the base and design scenarios with the Proposal in 2024 (last operational year of Stage 1) and in 2032 (10-year design horizon) are summarised in Table 5–3 and Table 5–4.

Table 5–3 – 2024 Operational Characteristics of the Nine Mile Road / Fogarty Road Intersection

Leg	Movement	2024 Base (without the Proposal)				2024 Design (with the Proposal (Stage 1))			
		AM		PM		AM		PM	
		DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)
Fogarty Road (South)	L	0.01	0	0.01	0	0.04	1	0.03	1
	R	0.01	0	0.01	0	0.04	1	0.03	1
Nine Mile Road (East)	L	0.01	0	0.02	0	0.03	0	0.05	0
	T	0.01	0	0.02	0	0.03	0	0.05	0
Nine Mile Road (West)	T	0.02	0	0.01	0	0.02	0	0.01	0
	R	0.02	0	0.01	0	0.02	0	0.01	0

Note: Practical Maximum DOS for a priority intersection is 0.80.

Table 5–4 – 2032 Operational Characteristics of the Nine Mile Road / Fogarty Road Intersection

Leg	Movement	2032 Base (without the Proposal)				2032 Design (with the Proposal (Stage 2 excluding RRR Project))			
		AM		PM		AM		PM	
		DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)	DOS (v/c)	95% Back of Queue (m)
Fogarty Road (South)	L	0.01	0	0.01	0	0.01	1	0.01	0
	R	0.01	0	0.01	0	0.01	1	0.01	0
Nine Mile Road (East)	L	0.01	0	0.03	0	0.02	0	0.03	0
	T	0.01	0	0.03	0	0.02	0	0.03	0
Nine Mile Road (West)	T	0.02	0	0.01	0	0.02	0	0.01	0
	R	0.02	0	0.01	0	0.02	0	0.01	0

Note: Practical Maximum DOS for a priority intersection is 0.80.

The results provided in Table 5–3 and Table 5–4 indicate that the Nine Mile Road / Fogarty Road intersection, as assessed, would operate well within satisfactory operating parameters in 2024 with Stage 1 of the Proposal and in 2032 with Stage 2 of the Proposal from a capacity viewpoint.

5.3 Intersection Performance of the Nine Mile Road / Ridgelands Road Intersection

Based on a review of the Nearmap imagery of the Nine Mile Road / Ridgelands Road intersection, it appears that a basic left turn (BAL) treatment and an "Old-type B" right turn treatment are provided at this intersection – this would be verified prior to the commencement of use. The modelled existing configuration of the Nine Mile Road / Ridgelands Road intersection, as assessed using SIDRA, is shown as Figure 5–3.

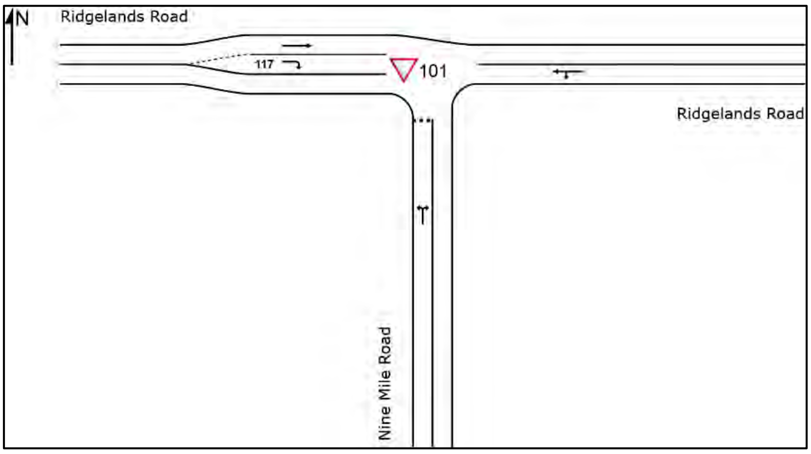

Figure 5–3 – Modelled Existing Configuration of the Nine Mile Road / Ridgelands Road Intersection

Results from the analyses of the Nine Mile Road / Ridgelands Road intersection for the base and design scenarios with the Proposal in 2024 (last operational year of Stage 1) and in 2032 (10-year design horizon) are summarised in Table 5–5 and Table 5-6.

Table 5–5 – 2024 Operational Characteristics of the Nine Mile Road / Ridgelands Road Intersection

Leg	Movement	2024 Base (without the Proposal)				2024 Design (with the Proposal (Stage 1))			
		AM		PM		AM		PM	
		DOS (v/c)	Delay (sec)	DOS (v/c)	Delay (sec)	DOS (v/c)	Delay (sec)	DOS (v/c)	Delay (sec)
Nine Mile Road (South)	L	0.07	6.8	0.03	7.8	0.12	6.8	0.08	7.8
	R	0.07	10.8	0.03	10.2	0.12	11.3	0.08	10.8
Ridgelands Road (East)	L	0.04	6.5	0.15	6.5	0.07	6.5	0.17	6.5
	T	0.04	0.0	0.15	0.0	0.07	0.0	0.17	0.1
Ridgelands Road (West)	T	0.14	0.0	0.04	0.0	0.14	0.0	0.04	0.0
	R	0.01	6.8	0.01	8.0	0.01	7.0	0.01	8.4
Max. DOS / Average Delay (base traffic)	-	0.14	1.4	0.15	1.4	0.14	1.4	0.17	1.5

Note: Practical Maximum DOS for a priority intersection is 0.80.

Table 5–6 – 2032 Operational Characteristics of the Nine Mile Road / Ridgelands Road Intersection

Leg	Movement	2032 Base (without the Proposal)				(with the Proposal (Stage 2 excluding RRR Project))			
		AM		PM		AM		PM	
		DOS (v/c)	Delay (sec)	DOS (v/c)	Delay (sec)	DOS (v/c)	Delay (sec)	DOS (v/c)	Delay (sec)
Nine Mile Road (South)	L	0.08	6.9	0.04	7.9	0.09	6.9	0.05	7.9
	R	0.08	11.3	0.04	10.7	0.09	11.4	0.05	10.8
Ridgelands Road (East)	L	0.05	6.5	0.16	6.5	0.05	6.5	0.16	6.5
	T	0.05	0.0	0.16	0.0	0.05	0.0	0.16	0.0
Ridgelands Road (West)	T	0.15	0.0	0.04	0.0	0.15	0.0	0.04	0.0
	R	0.01	6.9	0.01	8.2	0.01	6.9	0.01	8.3
Max. DOS / Average Delay (base traffic)	-	0.15	1.4	0.16	1.5	0.15	1.4	0.16	1.5

Note: Practical Maximum DOS for a priority intersection is 0.80.

The results provided in Table 5–5 and Table 5-6 indicate that the Nine Mile Road / Ridgelands Road intersection, as assessed, would operate well within satisfactory operating parameters in 2024 with Stage 1 of the Proposal and in 2032 with Stage 2 of the Proposal, from a capacity viewpoint.

The results provided in Table 5–5 and Table 5-6 indicate that Stage 1 of the Proposal and Stage 2 of the Proposal would increase average delay to base traffic movement by more than 5% during the PM peak hour period in 2024. However, it is important to note that the average delay of base traffic movements in 2024 and 2032 would be very small (less than 2 seconds); the Proposal would only increase the delay by ~0.1 second in 2024 (the increase in the average delay in absolute terms would be very small). Similar delay changes would be expected at the years of opening of each of stages.

Whilst this section considers the operation of intersections related to the Proposal from a capacity viewpoint, safety of these intersections has been assessed in Section 6 of this report.

Based on the results of the safety assessment, TTPlus recommends upgrading the left turn treatment of the Nine Mile Road / Ridgelands Road intersection from a BAL to an auxiliary left turn (short turn lane) (AUL(S)) treatment (it is noted that this recommendation relates to both Stage 1 and Stage 2 operation). It is noted that that the Department of State Development, Manufacturing, Infrastructure and Planning imposed a condition of approval for upgrading the left turn lane treatment of the Ridgelands Road / Nine Mile Road intersection to a type AUL(S) prior to commencement of the use of another project (State reference: 1906-11906 SRA) in 2019 and that project has since commenced.

6 Safety Assessment

As previously identified, the Proposal (for material hauled to both the RRR Project and the general market) would not have a significant traffic impact on the external road network beyond Point 6 on Ridgelands Road (as illustrated on Figure 3–1). Therefore, the study area of the safety assessment of the Proposal is from the site access on Fogarty Road up to Point 6 on Ridgelands Road.

Whilst the previous section of this report considers the operation of the key intersections related to the Proposal from a capacity viewpoint, safety of these intersections is also required to be assessed.

In consideration of safety, it is important to consider the appropriate geometries and locations of these intersections. This includes consideration of the following features:

- Sight distances;
- Turn lane warrants;
- Crash data, and
- Any other relevant safety features.

There are no relevant safety features other than sight distances, crash data and the potential need to consider higher order turn lane treatments (which have all been assessed in the following sections).

6.1 Sight Distances

Sight distances available at the existing site access on Fogarty Road have been assessed.

The typically sought safe intersection sight distances (SISD) and approach sight distances (ASD) as per the requirements identified in Austroads' "*Guide to Road Design Part 4A: Unsignalised and Signalised Intersection, 2017*" (Ref.2), and whether the sight distances available for the Fogarty Road Site Access intersection comply with the Austroads' requirements are summarised in Table 6–1.

Table 6–1 – Review of Sight Distances at the Fogarty Road Site Access

Intersection	Leg of Intersection	Design Speed of Major Road*	Identified SISD (Ref.2)	Identified ASD (Ref.2)	Available Sight Distance complies with **Austroads'** Provision	
					SISD	ASD
Fogarty Road Site Access	North	110km/h	285m	193m	Yes	Yes
	South	110km/h	285m	193m	Yes	Yes

**It is assumed that Fogarty Road has a speed limit of 100km/h as there is no posted speed limit (the speed limit outside built-up areas in Queensland is 100km/h unless otherwise indicated by signs). The analysis has adopted a design speed allowance of 10km/h above the assumed speed limit.*

The typically sought SISD (285m) related to the Fogarty Road Site Access and the general contours near the Subject Site are illustrated on Figure 6–1.

A photo was taken from the Subject Site looking towards the Fogarty Road Site Access and Fogarty Road which is illustrated as Photo 6-1. TTPlus has been advised that Fogarty Road is relatively flat near and along the site frontage, which is reflected in Photo 6–1.

Based on a review of the site photo, available aerial imagery and contours on Queensland Globe (refer to Figure 6–1), it is evident that Fogarty Road is straight and flat proximate to the site access, therefore the sight distances available at the Fogarty Road Site Access intersection would comply with the Austroads' sought after sight distances.

This would be verified at the detailed design stage.

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[2] "Guide to Road Design Part 4A: Unsignalised and Signalised Intersection", Austroads, 2017.

Photo 6–1 – Looking East from the Subject Site to the Site Access on Fogarty Road
[annotations added by TTPlus]

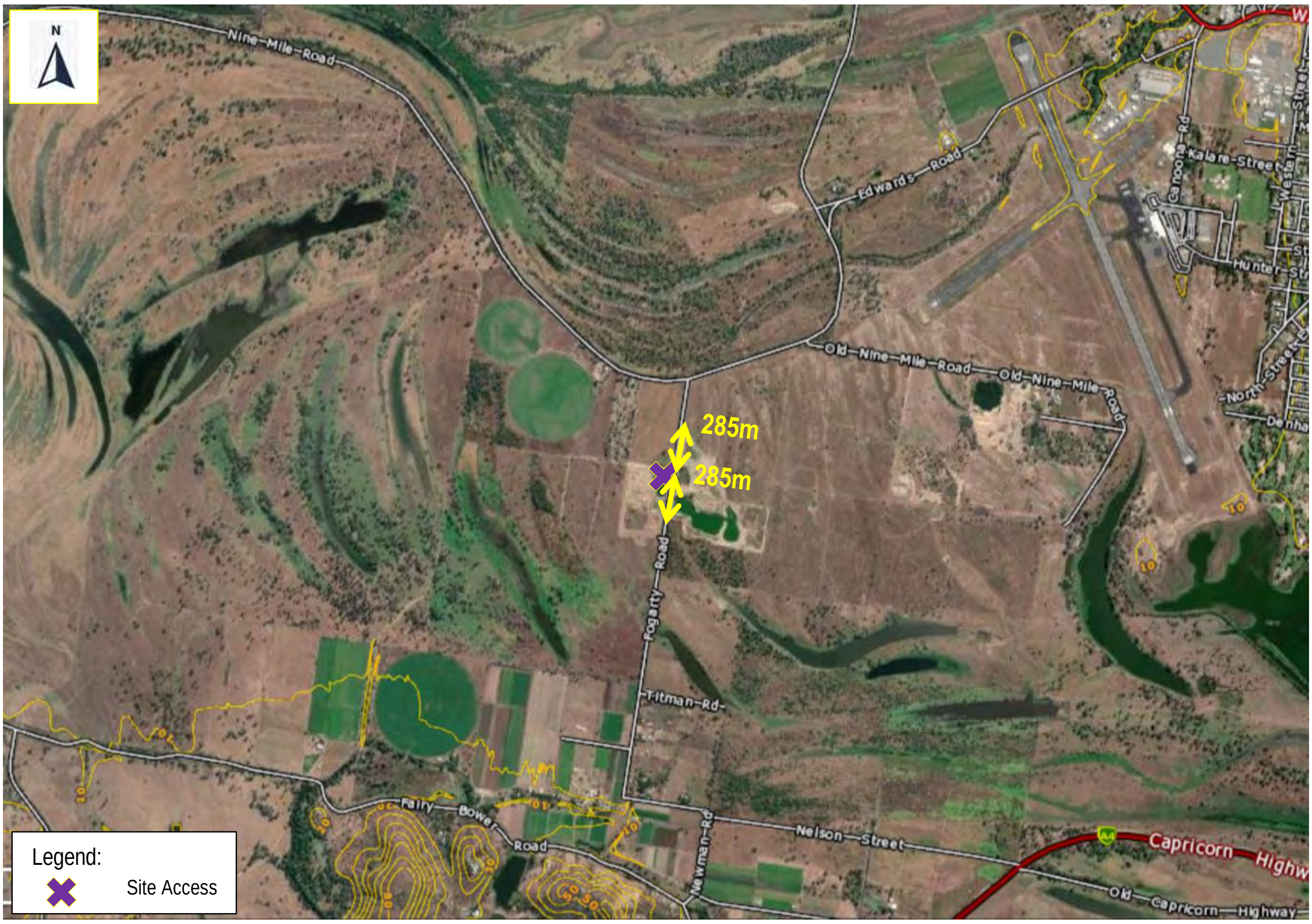


Figure 6–1 – Contour Map and Sight Distances
Source: https://qldglobe.information.qld.gov.au/ [annotations and sight distances added by TTPlus]

6.2 Turn Lane Treatments

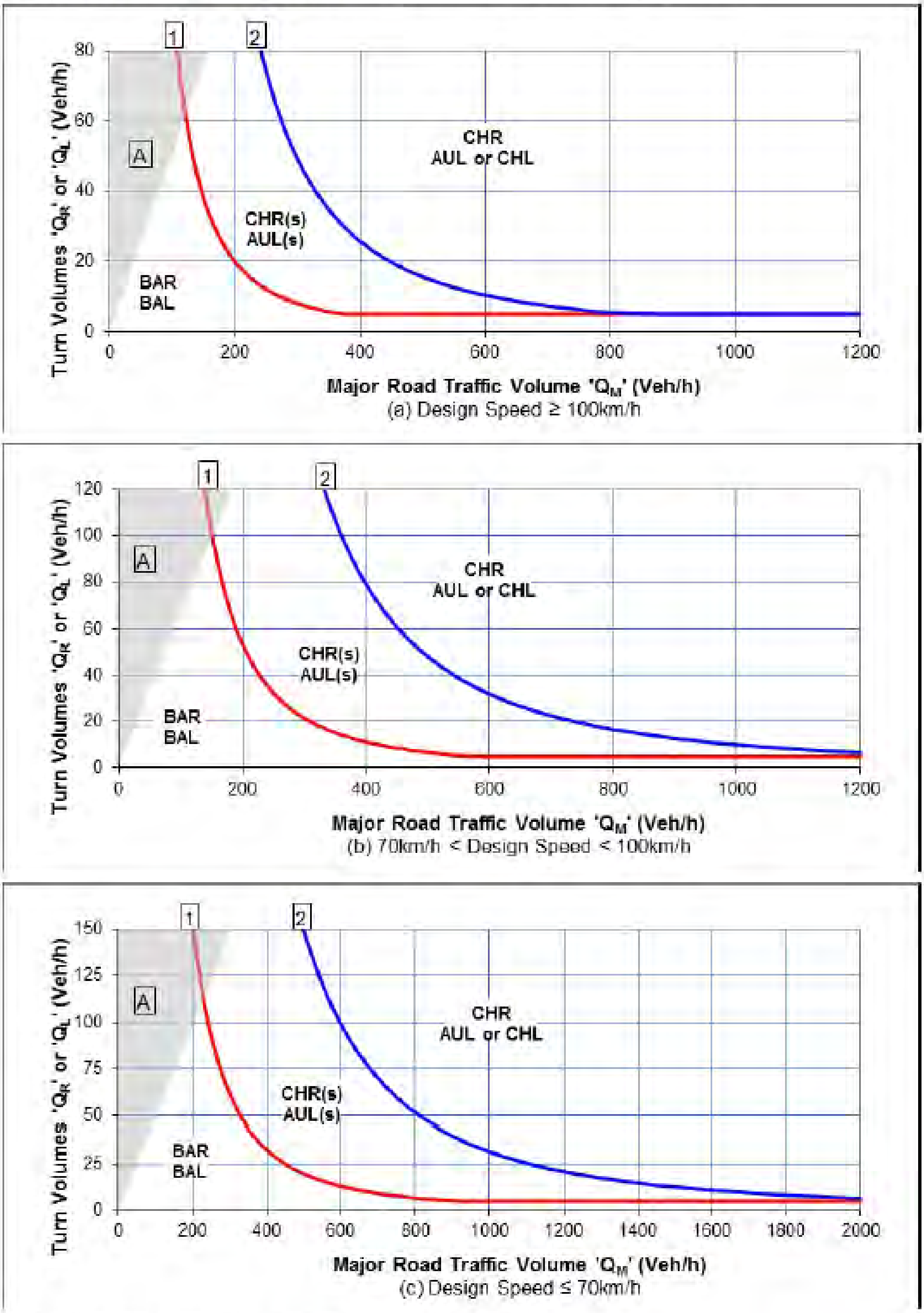
Considering the likely design traffic scenarios for the last operational year of Stage 1 (2024 AM and PM design scenarios) and the 10-year design horizon of the Proposal (2032 AM and PM design scenarios) ensures the warrants for the possible need to consider higher order turn lane treatments at key intersections are properly tested for all anticipated traffic conditions with the Proposal.

The turn lane treatments that may ordinarily be sought for the above key intersections to ensure appropriately safe operation are determined by plotting the design traffic volumes on the graphs included as *Figure 4A–1 Warrants – Major Road Turn Treatments – Normal Design Domain* contained within DTMR's "*Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections"* (Ref.3) duplicated as Figure 6–2.

[3] "Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections, Road Planning and Design Manual – Edition 2: Volume 3", DTMR, August 2014.

Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections

Figure 4A-1 - Warrants - major road turn treatments - Normal Design Domain



(*) the minimum right turn treatment for multi-lane roads is a CHR(s)

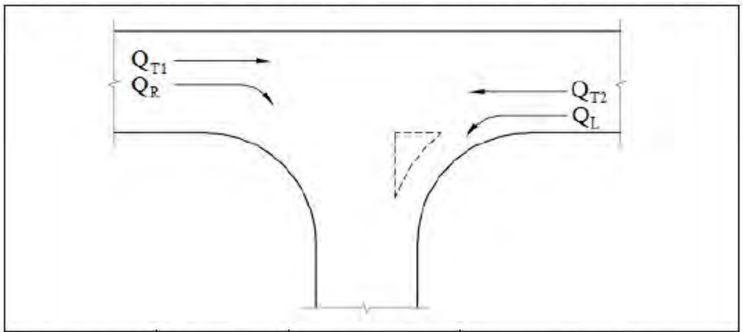
Figure 6–2 – Warrants for Turn Lane Treatments

(Source: Ref.3)

The x–axis (Q_M) and y–axis (Q_L and Q_R) on these graphs relate to the following:

- Q_R = Right turn traffic volume (vph);
- Q_L = Left turn traffic volume (vph), and
- Q_M = Major road traffic volume which is calculated in accordance with Figure 4A–2 Calculation of the Major Road Traffic Volume Parameter 'Q_M' (Ref.3), duplicated as Figure 6–3.

Figure 4A-2 - Calculation of the major road traffic volume parameter 'Q_M'



Road Type	Turn Type	Splitter Island	Q_M (veh/h)
2 Lane 2 Way	Right	No	$= Q_{T1} + Q_{T2} + Q_L$
		Yes	$= Q_{T1} + Q_{T2}$
	Left	Yes/No	$= Q_{T2}$
4 Lane 2 Way	Right	No	$= 50\% \times Q_{T1} + Q_{T2} + Q_L$
		Yes	$= 50\% \times Q_{T1} + Q_{T2}$
	Left	Yes/No	$= 50\% \times Q_{T2}$
6 Lane 2 Way	Right	No	$= 33\% \times Q_{T1} + Q_{T2} + Q_L$
		Yes	$= 33\% \times Q_{T1} + Q_{T2}$
	Left	Yes/No	$= 33\% \times Q_{T2}$

Figure 6–3 – Calculation of Major Road Traffic Volumes

(Source: Ref.3)

6.2.1 Turn Lane Assessment of the Fogarty Road Site Access Intersection

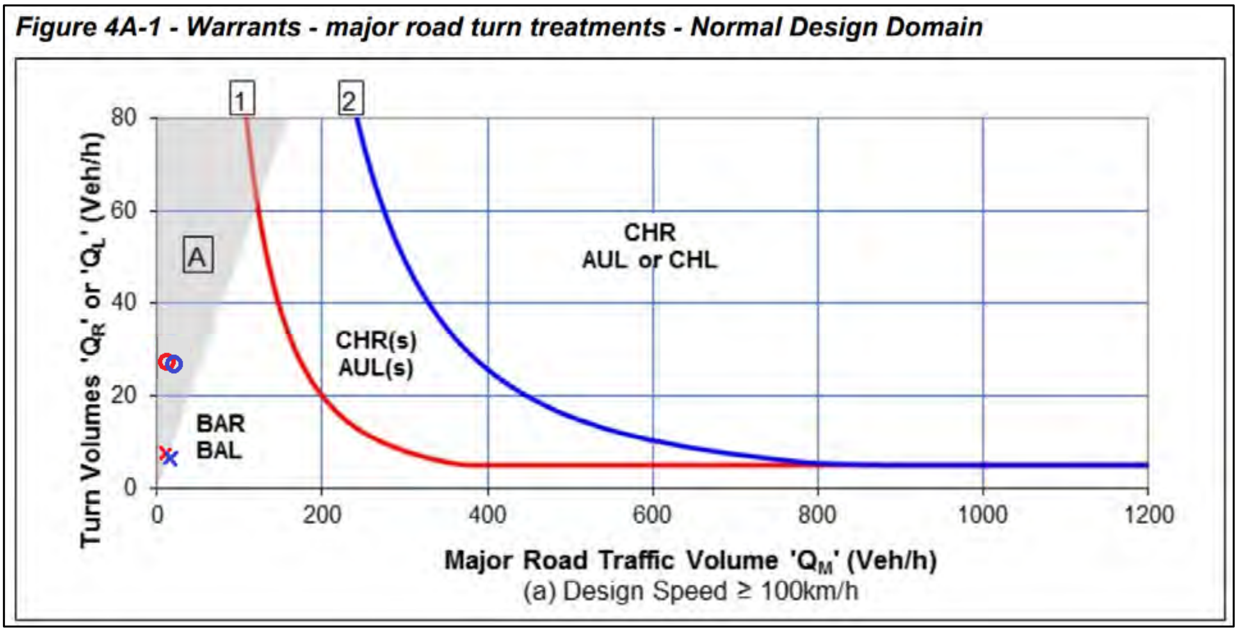
The majority of trips associated with the Proposal would only turn right from Fogarty Road into the site access, therefore only the right turn lane treatment is required to be assessed. By applying the calculations indicated from within Figure 6–3, the following relevant traffic volume parameters for the right turn and through movements for the 2024 AM and PM design scenarios and 2032 AM and PM design scenarios were established. The traffic volume parameters for each assessment scenario are summarised in Table 6–2.

Table 6–2 – Design Traffic Volume Parameters – Fogarty Road Site Access Intersection

Scenario	Traffic Movement	Traffic Volume (vph) 2024 Design (with the Proposal (Stage 1))		Traffic Volume (vph) 2032 Design (with the Proposal (Stage 2 excluding RRR Project))	
		AM	PM	AM	PM
Right Turn Scenario	Q_R	28	27	9	8
	Q_{MR}	2	5	2	5

In order to illustrate the identified right turn lane treatment ideally sought to be provided at the Fogarty Road Site Access intersection for each of the above scenarios, the traffic volume parameters determined in Table 6–2 have been plotted on Figure 4A–1(a) (Ref.3) (refer to Figure 6–2). It is assumed that the design speed of Fogarty Road is 110km/h.

The coordinates of the assessed cases are as indicated approximately on Figure 6–4.



o 2024 AM – Right Turn	o 2024 PM – Right Turn
x 2032 AM – Right Turn	x 2032 PM – Right Turn

Figure 6–4 – Warrants for Turn Lane Treatments – Fogarty Road Site Access Intersection

Based on the results illustrated on Figure 6–4, it is apparent that a higher order turn lane treatment is not required to be provided at the Fogarty Road Site Access intersection. The existing site access is anticipated to continue to operate safely.

6.2.2 Turn Lane Assessment of the Nine Mile Road / Fogarty Road Intersection

The majority of trips associated with the Proposal would turn left from Nine Mile Road into Fogarty Road, therefore only the left turn lane treatment is required to be assessed.

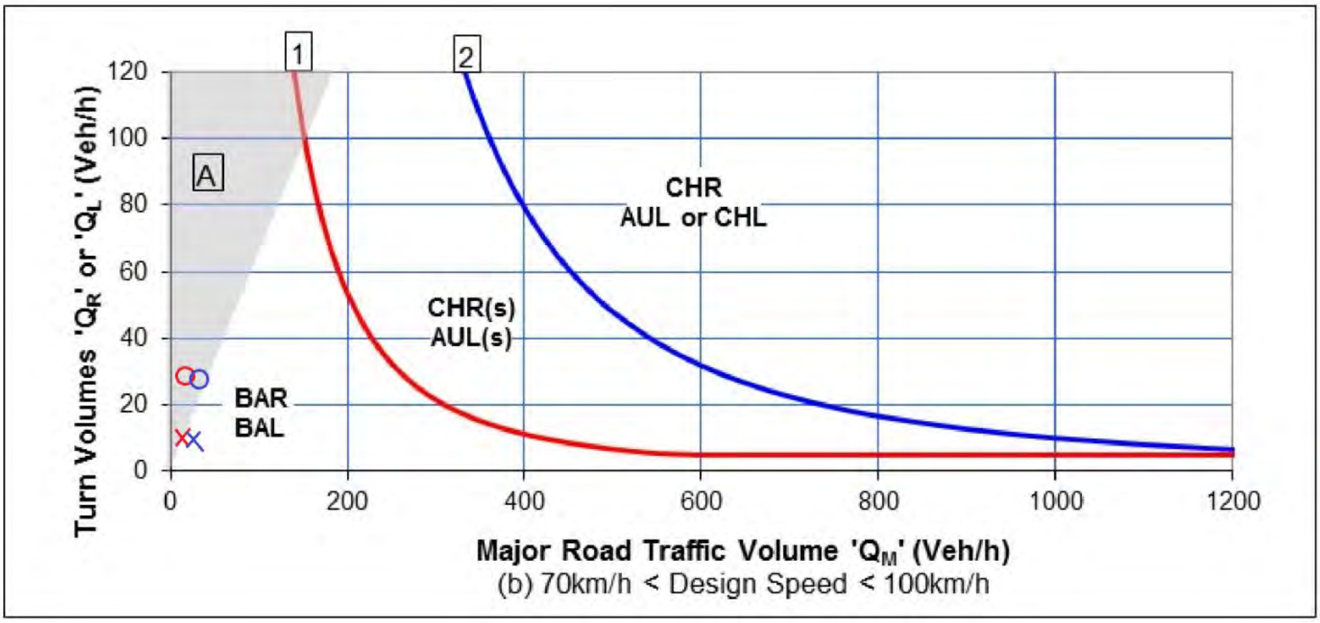
By applying the calculations indicated from within Figure 6–3, the following relevant traffic volume parameters for the left turn and through movements for the 2024 AM and PM design scenarios and 2032 AM and PM design scenarios were established. The traffic volume parameters for each assessment scenario are summarised in Table 6–3.

Table 6–3 – Design Traffic Volume Parameters – Nine Mile Road / Fogarty Road Intersection

Scenario	Traffic Movement	Traffic Volume (vph) 2024 Design (with the Proposal (Stage 1))		Traffic Volume (vph) 2032 Design (with the Proposal (Stage 2 excluding RRR Project))	
		AM	PM	AM	PM
Left Turn Scenario	Q_L	30	29	12	11
	Q_{ML}	6	31	7	33

In order to illustrate whether a higher order turn lane treatment would ideally be sought to be provided at the Nine Mile Road / Fogarty Road intersection for each of the above scenarios, the traffic volume parameters determined in Table 6–3 have been plotted on Figure 4A–1(b) (Ref.3) (refer to Figure 6–5). Adopting the typical design allowance of 10km/h above the posted speed limit, the design speed of Nine Mile Road is 90km/h.

The coordinates of the assessed cases are as indicated approximately on Figure 6–5.



x 2024 AM – Left Turn	x 2024 PM – Left Turn
o 2032 AM – Left Turn	o 2032 PM – Left Turn

Figure 6–5 – Warrants for Turn Lane Treatments – Nine Mile Road / Fogarty Road Intersection

Based on the results illustrated on Figure 6–5, it is apparent that a higher order left turn lane treatment is not required to be provided at the Nine Mile Road / Fogarty Road intersection. Therefore, the existing geometry of the Nine Mile Road / Fogarty Road intersection is considered to be appropriate.

6.2.3 Turn Lane Assessment of the Nine Mile Road / Ridgelands Road Intersection

The majority of trips associated with the Proposal would turn left from Ridgelands Road into Nine Mile Road, therefore only the left turn lane treatment is required to be assessed.

By applying the calculations indicated from within Figure 6–3, the following relevant traffic volume parameters for the left turn and through movements for the 2024 AM and PM design scenarios and 2032 AM and PM design scenarios were established. The traffic volume parameters for each assessment scenario are summarised in Table 6–4.

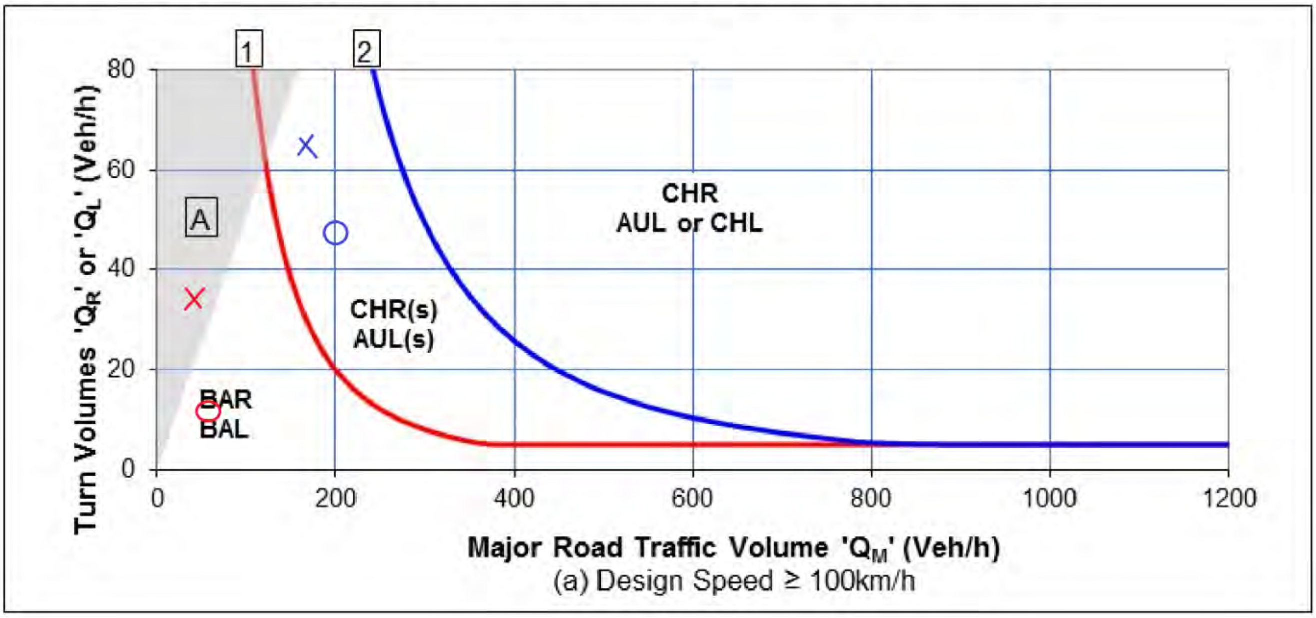
Table 6–4 – Design Traffic Volume Parameters – Nine Mile Road / Ridgelands Road Intersection

Scenario	Traffic Movement	Traffic Volume (vph) 2024 Design (with the Proposal (Stage 1))		Traffic Volume (vph) 2032 Design (with the Proposal (Stage 2 excluding RRR Project))	
		AM	PM	AM	PM
Left Turn Scenario	Q_L	35	63	17	47
	Q_{ML}	56	184	60	200

In order to illustrate whether a higher order turn lane treatment would ideally be sought to be provided at the Nine Mile Road / Ridgelands Road intersection for each of the above scenarios, the traffic volume parameters determined in Table 6–4 have been plotted on Figure 4A–1(a) (Ref.3) (refer to Figure 6–6). Adopting the typical design allowance of 10km/h above the posted speed limit, the design speed of Ridgelands Road is 110km/h.

The coordinates of the assessed cases are as indicated approximately on Figure 6–6.

Figure 4A-1 - Warrants - major road turn treatments - Normal Design Domain



x 2024 AM – Left Turn	x 2024 PM – Left Turn
o 2032 AM – Left Turn	o 2032 PM – Left Turn

Figure 6–6 – Warrants for Turn Lane Treatments – Nine Mile Road / Ridgelands Road Intersection

Based on the results illustrated on Figure 6–6, it is apparent that an AUL(S) treatment is required to be provided at the Nine Mile Road / Ridgelands Road intersection.

Based on a review of the Nearmap imagery of the Nine Mile Road / Ridgelands Road intersection, it appears that a BAL and an "Old-type B" right turn treatment are provided at this intersection. TTPlus recommends providing an AUL(S) treatment at the Nine Mile Road / Ridgelands Road intersection to align with the above assessment (it is noted that this recommendation relates to both the Stage 1 and Stage 2 operation). As mentioned previously, the Department of State Development, Manufacturing, Infrastructure and Planning imposed a condition of approval for upgrading the left turn lane treatment of the Ridgelands Road / Nine Mile Road intersection to a type AUL(S) prior to commencement of the use of another project (State reference: 1906-11906 SRA) in 2019 and that project has since commenced.

6.3 Crash Statistics

The Queensland Government database (https://www.data.qld.gov.au/dataset/crash–data–from–queensland–roads) provides recorded road crash data that can be used to understand what, if any, crash history exists at the key intersections near the Subject Site.

The routinely adopted crash frequency and time window metric when issues may be considered to be significant is 3 casualty crashes in the last 5 years.

From review of the crash data from 2016 to the end of 2020 (ie. the most recent 5 years of available data), there have been no reported crashes near the Fogarty Road Site Access location or at the Nine Mile Road / Fogarty Road intersection and there has been one fatal crash reported in 2018 at the Nine Mile Road / Ridgelands Road intersection. Whilst crashes can be somewhat arbitrary and traffic volumes are relatively low proximate, it is considered that there are no systematic safety issues at the Fogarty Road Site Access location and the Nine Mile Road / Fogarty Road intersection that would reasonably require further consideration.

It is considered that the recommended AUL(S) treatment at the Nine Mile Road / Ridgelands Road intersection, although not directly related to the 2018 crash, would nonetheless improve the safety of the Nine Mile Road / Ridgelands Road intersection.

6.4 Conclusions in relation to Safety

Based on the results of the SIDRA analysis, the turn lane treatment assessment and review of the historical crash data, the additional traffic associated with the Proposal would only generate marginal impacts at the key intersections related to the Proposal, even including the concept of a “peak hour factor”.

No additional infrastructure improvement works associated with the Proposal are necessary to ensure the safe and efficient operation of the road network, except for the AUL(S) treatment recommended to be provided at the Nine Mile Road / Ridgelands Road intersection.

If the completion year of the RRR Project was to be delayed for a few years due to unforeseen circumstances, TTPlus notes that there would be no changes to the recommended external infrastructure works associated with the Proposal if Stage 1 of the Proposal continued to operate during these extra years. Similarly, if the RRR Project finishes earlier than modelled, there would be no traffic engineering issues of concern. Therefore, any conditions imposed by Council and DTMR for Stage 1 will need to allow for flexibility at the start, end and for the duration of delivery of material to the RRR Project.

7 Potential Need for Works on Council Controlled Roads

The existing approved transport route related to the Subject Site is Fogarty Road, Nine Mile Road and Ridgelands Road (illustrated by the blue dotted lines on Figure 3–1) – this existing approved transport route would be continued to be utilised by the Proposal.

As identified previously, the design vehicle sought to be used by the Proposal for the hauling activities is a B-double. Ridgelands Road (a SCR) included in the transport routes is suitable for vehicles up to B-doubles. The suitability of Fogarty Road and Nine Mile Road (Council controlled roads) for the use of B-doubles and the Proposal has been assessed and discussed below.

<u>Fogarty Road</u>

Fogarty Road is not a council-maintained road, it is currently maintained by quarry operators (Rockhampton Sands Quarry and Hardcore Sands Quarry).

The existing Fogarty Road Site Access intersection is located approximately 0.55km south of the Nine Mile Road / Fogarty Road intersection. Fogarty Road is sealed between Nine Mile Road and the site access of the adjacent Hardcore Sands Quarry and it is unsealed further south; the sealed and unsealed sections are illustrated on Figure 7-1. The road width of Fogarty Road between the site access and Nine Mile Road is a minimum 7.2m – the road width has been measured using the measuring tool of Nearmap.

Figure 7–1 – Sealed and Unsealed Sections of Fogarty Road
Source: Google Earth [annotations and road names added by TTPlus]

Unsealed section of Fogarty Road

To consider whether it is appropriate for the unsealed section of Fogarty Road to remain unsealed, reference has been made to the document "*Upgrading of Unsealed Rural Roads to Sealed Standard*" (Ref.4) of Rockhampton Regional Council.

Ref.4 is based on Austroads design standards (Ref. 5) and suggests that *"… An unsealed rural road must be in the range of 150-500 AADT (Annual Average Daily Traffic). A road will not be considered for a minimum standard seal if there is less than 150 AADT unless there are significant issues shown in assessment score. A road that has an AADT greater than 500 will qualify for a full road design".*

Based on the results of the traffic surveys undertaken at the Fogarty Road Site Access intersection on Friday 13 August 2021 from 6:30am to 9:30am and from 2:30pm to 6:00pm, there were 40 vehicles using Fogarty Road during the whole survey period. It is acknowledged that some vehicles would have been likely to use Fogarty Road at other times.

Due to the current low daily traffic volumes on Fogarty Road (likely to be less than 80vpd) and the relatively low number of additional car and truck trips generated by the Proposal (~230vpd in Stage 1 up to 2024 and ~80vpd in Stage 2), the estimated daily traffic volumes on Fogarty Road with the Proposal would be much less than 500vpd. Therefore, the retention of the unsealed carriageway on Fogarty Road is considered to be acceptable.

Road width of Fogarty Road

Austroads' "*Guide to Road Design Part 3: Geometric Design"* states that "*The provision of standard lane widths of 3.5 m allows for large vehicles to pass or overtake.*" In the context of this matter, this indicates that the minimum 7.2m road width (greater than 2 x 3.5m lanes) provides sufficient room for large vehicles to pass.

The existing road width of minimum 7.2m of Fogarty Road is anticipated to continue to operate safely and efficiently with the Proposal.

Nine Mile Road

The section of Nine Mile Road between Fogarty Road and Ridgelands Road is approximately 4.5km long, with this whole section of Nine Mile Road being sealed. The road width of Nine Mile Road between Fogarty Road and Ridgelands Road is a minimum 7.2m.

The existing road width of minimum 7.2m of Nine Mile Road is anticipated to continue to operate safely and efficiently with the Proposal.

It is expected that these roads would continue to be fit-for-purpose.

[4] "Upgrading of Unsealed Rural Roads to Sealed Standard – Procedure No. Pro.I1.4", Rockhampton Regional Council, October 2011.
[5] "Guide to the Geometric Design of Rural Roads, Urban Road Design – Geometric Design for Major Urban Roads, Pavement Design – A Guide to the Structural Design of Road Pavements", Austroads, various dates.

Pavement Contributions for Impacts on Council Controlled Roads

As discussed in Section 4.1 of this report, the Proposal (for material hauled to both the RRR Project and the general market) would not have a significant traffic impact on the external (State and Council) road network beyond Point 6 on Ridgelands Road (as illustrated on Figure 3–1) as no RRR-related haulage would occur beyond Point 6.

In addition, the quarry trucks would predominantly travel on SRCs beyond Point 6, except that they need to deliver material to some local catchments, therefore it is likely that the Proposal would not have a significant traffic or pavement impact on the Council road network beyond Point 6 on Ridgelands Road.

Therefore, no further assessment of pavement impacts on the Council road network beyond Ridgelands Road is required. As such, any assessment of pavement impacts on the Council road network would be limited to transport routes utilised by the existing quarry (ie. Fogarty Road and Nine Mile Road).

TTPlus has been advised that the existing quarry is conditioned to pay a road maintenance levy of $0.22 per tonne, with CPI increase. It is recommended that the Proposal should be conditioned to continue to pay the same contribution per tonne ($0.22 per tonne) as the existing quarry. It is noted that the calculated pavement contribution on SCRs for impacts associated with the Proposal, determined using DTMR's GTIA, is less than half of this rate (refer to Section 8 of this report).

8 Pavement Contribution Assessment

8.1 Pavement Contribution Assessment on State Controlled Roads

The Rockhampton Sands Quarry currently enjoys an EA that allows for haulage / extraction of up to 100,000tpa. For the purpose of this traffic and pavement impact assessment, it is assumed that in Stage 1 the Proposal would produce up to 1,000,000tpa until 2024 (conservatively assumed to comprise a supply of up to 250,000tpa of material to the general market and up to 750,000tpa of material to the RRR Project [in that delivery to the RRR Project is less impactful]). From 2025 onwards, Stage 2 of the Proposal has been modelled to supply up to 250,000tpa of material to the general market.

The appropriate contributions for pavement impacts associated with the Proposal (Stage 1 and Stage 2) on SCRs have been determined using DTMR's GTIA (Ref.1).

8.1.1 Assessment Parameters

The following assessment parameters have been adopted in this pavement contribution assessment:

<u>Stage 1:</u>

- Annual production rate: 1Mtpa (conservatively assumed to comprise a supply of up to 250,000tpa of material to the general market and up to 750,000tpa of material to the RRR Project);
- Operational years: 2022 to 2024;
- AADT data: 2020 data sourced from DTMR;
- AADT growth rate: 1.0% p.a. (compound), which is consistent with the traffic growth rate adopted in the traffic impact assessment of this report;
- Marginal Cost: 2020 data sourced from DTMR, and
- Catchments: TTPlus has been advised that the delivery of material to the RRR Project would be made near Point 3, Point 4 and Point 6 (as illustrated on Figure 3–1) where the RRR Project alignment intersects with the existing road network. Within the modelling outlined herein, it has been conservatively assumed that all delivery of material to the RRR Project would be made via Point 6 on Ridgelands Road (as illustrated on Figure 3–1), being the furthest potential delivery point from the Subject Site. TTPlus has been advised that the delivery of material to the general market would be hauled towards Rockhampton and to the Bruce Highway (north and south).

<u>Stage 2:</u>

- Annual production rate: 250,000tpa of material to the general market;
- Operational years: 2025 and onwards;
- AADT data: 2020 data sourced from DTMR;
- AADT growth rate: 1.0% p.a. (compound), which is consistent with the traffic growth rate adopted in the traffic impact assessment of this report;
- Marginal Cost: 2020 data sourced from DTMR, and
- Catchments: TTPlus has been advised that the delivery of material to the general market would be hauled towards Rockhampton and to the Bruce Highway (north and south).

The likely operational parameters of the Proposal have been previously discussed in Section 4.4 of this report.

8.1.2 Pavement Contributions on State Controlled Roads

The calculations of the applicable pavement contributions for the pavement impacts on SCRs associated with Stage 1 and Stage 2 of the Proposal, undertaken based on DTMR's GTIA, have been included as Appendix E. As requested by SARA, an electronic copy of the Excel file will be provided.

The calculated pavement contribution on SCRs for impacts associated with the Proposal (Stage 1 and Stage 2), determined using DTMR's GTIA, are illustrated in Table 8–1 and Table 8–2. It is noted that the calculations have been presented in a format which allow a lesser contribution rate in years of low production and a higher rate for years of higher production. Given that the calculated contribution rates are essentially the same, no differentiation would be required.

Table 8–1 – Pavement Contribution for Impacts on SCRs (Stage 1)

Production Rate			Pavement Contribution (cents / tonne)
(For the material hauled to the RRR Project)	(For the material hauled to the general market)	(Total)	
Up to 450,000tpa	Up to 250,000tpa	Up to 700,000tpa	10.10
Up to 550,000tpa	Up to 250,000tpa	Up to 800,000tpa	10.11
Up to 650,000tpa	Up to 250,000tpa	Up to 900,000tpa	10.12
Up to 750,000tpa	Up to 250,000tpa	Up to 1,000,000tpa	10.12

Table 8–2 – Pavement Contribution for Impacts on SCRs (Stage 2)

Production Rate (For the material hauled to the general market)	Pavement Contribution (cents / tonne)
Up to 150,000tpa	7.40
Up to 250,000tpa	7.40

9 Summary of Findings

TTPlus has been commissioned by Rockhampton Sands Pty Ltd to prepare a traffic and pavement impact assessment report as part of a development application for Rockhampton Sands Quarry located at 250 Fogarty Road, Fairy Bower, QLD, properly described as Lot 250 on R2621 (Subject Site).

The Rockhampton Sands Quarry currently enjoys an Environmental Authority that allows for haulage / extraction of up to 100,000tpa.

The proposed application seeks to temporarily increase the annual extraction volume to 1,000,000tpa to supply material to the Department of Transport and Main Roads' (DTMR) Rockhampton Ring Road Project (RRR Project). An aspect of the proposal is that once the RRR Project has been completed, the annual production rate being applied for would reduce to 250,000tpa for delivery to the general market only (Proposal).

For the purpose of this assessment, the Proposal consists of two stages being:

- Stage 1: During construction of the RRR Project, the total annual production will not exceed 1,000,000tpa, which may include up to 250,000tpa of material to the general market, and
- Stage 2: After construction of the RRR Project, the total annual production will not exceed 250,000tpa of material to the general market.

A traffic and pavement impact assessment report, dated 1 December 2021, has been prepared to assess the potential traffic and pavement impacts associated with the Proposal. Since that time, information requests have been issued:

- Queensland Government: "*SARA information request – 250 Fogarty Road, Fairy Bower*" on 27 January 2022 (SARA Information Request); and
- Rockhampton Regional Council (Council): "*Amended information request – Development application D/589-2013 for 'Other change' to a material change of use for extractive industry (extension) – Situated at Lot 250 Fogarty Road, Fairy Bower – Described as Lot 250 on R2621"* on 12 January 2022 (Council Information Request).

This updated traffic and pavement impact assessment report has been prepared to address the traffic, pavement and road safety request items included in the SARA Information Request and Council Information Request.

For the purpose of this traffic and pavement impact assessment, it is assumed that Stage 1 of the Proposal would commence operation in 2022, produce up to 1,000,000tpa until 2024 and then produce up to 250,000tpa from 2025 onwards in Stage 2 of the Proposal. The precise timing of the construction phase of the RRR Project is likely to vary. Therefore, any conditions imposed by Council and DTMR for Stage 1 will need to allow for flexibility at the start, end, and for the duration of delivery of material to the RRR Project. It is noted that none of the conclusions outlined in this report are particularly time sensitive.

The site layout plan for the Proposal is included as Appendix A.

<u>Site Access</u>

The existing site access on Fogarty Road is located approximately 0.55km south of the Nine Mile Road / Fogarty Road intersection.

<u>Transport Routes</u>

The existing haul routes to the general market and the proposed transport route to the RRR Project have been discussed in Section 3 of this report.

Traffic Impact Assessment and Safety Assessment

As discussed in Section 4.1 of this report, the Proposal (for material hauled to both the RRR Project and the general market) would not have a significant traffic impact on the external (State and Council) road network beyond Point 6 on Ridgelands Road (as illustrated on Figure 3–1) as no RRR-related haulage would occur beyond Point 6.

Therefore consideration of the appropriate GTIA-defined 'Impact Assessment Area' yields the requirement to assess the operational performance of the Fogarty Road Site Access intersection, the Nine Mile Road / Fogarty Road intersection and the Nine Mile Road / Ridgelands Road intersection. These intersections have been assessed, and the findings of that assessment outlined within this report in order to fully quantify the potential impacts on the external road network.

The results of the SIDRA analyses included in Section 5 of this report illustrate that the existing Fogarty Road Site Access intersection, the existing Nine Mile Road / Fogarty Road intersection and the existing Nine Mile Road / Ridgelands Road intersection, as assessed, would operate well within satisfactory operating parameters with Stage 1 and Stage 2 of the Proposal from a capacity viewpoint. There will be no capacity issues even if the completion year of the RRR Project was delayed for one or two years (or alternatively the RRR Project was accelerated).

The results of the safety assessment (including turn lane treatment assessments) included in Section 6 of this report indicate that there are no specific safety concerns along the transport routes. TTPlus recommends providing an auxiliary left turn (short turn lane) (AUL(S)) treatment at the Nine Mile Road / Ridgelands Road intersection, which would improve the safety of the intersection. It is noted that that the Department of State Development, Manufacturing, Infrastructure and Planning imposed a condition of approval for upgrading the left turn lane treatment of the Ridgelands Road / Nine Mile Road intersection to a type AUL(S) prior to commencement of the use of another project (State reference: 1906-11906 SRA) in 2019 and that project has since commenced.

No other additional infrastructure improvement works associated with the Proposal are necessary to ensure the safe and efficient operation of the road network.

If the completion year of the RRR Project was to be delayed for a few years due to unforeseen circumstances, TTPlus notes that there would be no changes to the recommended external infrastructure works associated with the Proposal if Stage 1 of the Proposal continued to operate during these extra years. Similarly, if the RRR Project finishes earlier than modelled, there would be no traffic engineering issues of concern. Therefore, any conditions imposed by Council and DTMR for Stage 1 will need to allow for flexibility at the start, end, and for the duration of delivery of material to the RRR Project.

The Potential Need for Works on Council Controlled Roads

Fogarty Road is not a council-maintained road, it is currently maintained by quarry operators (Rockhampton Sands Quarry and Hardcore Sands Quarry).

Fogarty Road is sealed between Nine Mile Road and the site access of the adjacent Hardcore Sands Quarry and it is unsealed further south. Due to the current low daily traffic volumes on Fogarty Road and the relatively low number of additional car and truck trips generated by the Proposal, the retention of the unsealed carriageway on Fogarty Road is considered to be safe and acceptable. Additionally, the existing Fogarty Road width of minimum 7.2m is anticipated to continue to operate safely and efficiently with the Proposal.

The section of Nine Mile Road between Fogarty Road and Ridgelands Road is approximately 4.5km long, with this whole section of Nice Mile Road being sealed. The existing Nine Mile Road width of minimum 7.2m is anticipated to continue to operate safely and efficiently with the Proposal.

It is expected that these roads would continue to be fit-for-purpose.

Pavement Contributions for Impacts on Council Controlled Roads

TTPlus has been advised that the existing quarry is conditioned to pay a road maintenance levy of $0.22 per tonne, with CPI increase. It is recommended that the Proposal should be conditioned to continue to pay the same contribution per tonne ($0.22 per tonne) as the existing quarry. It is noted that the calculated pavement contribution on SCRs for impacts associated with the Proposal, determined using DTMR's GTIA, is less than half of this rate.

Pavement Contributions for Impacts on State Controlled Roads (SCRs)

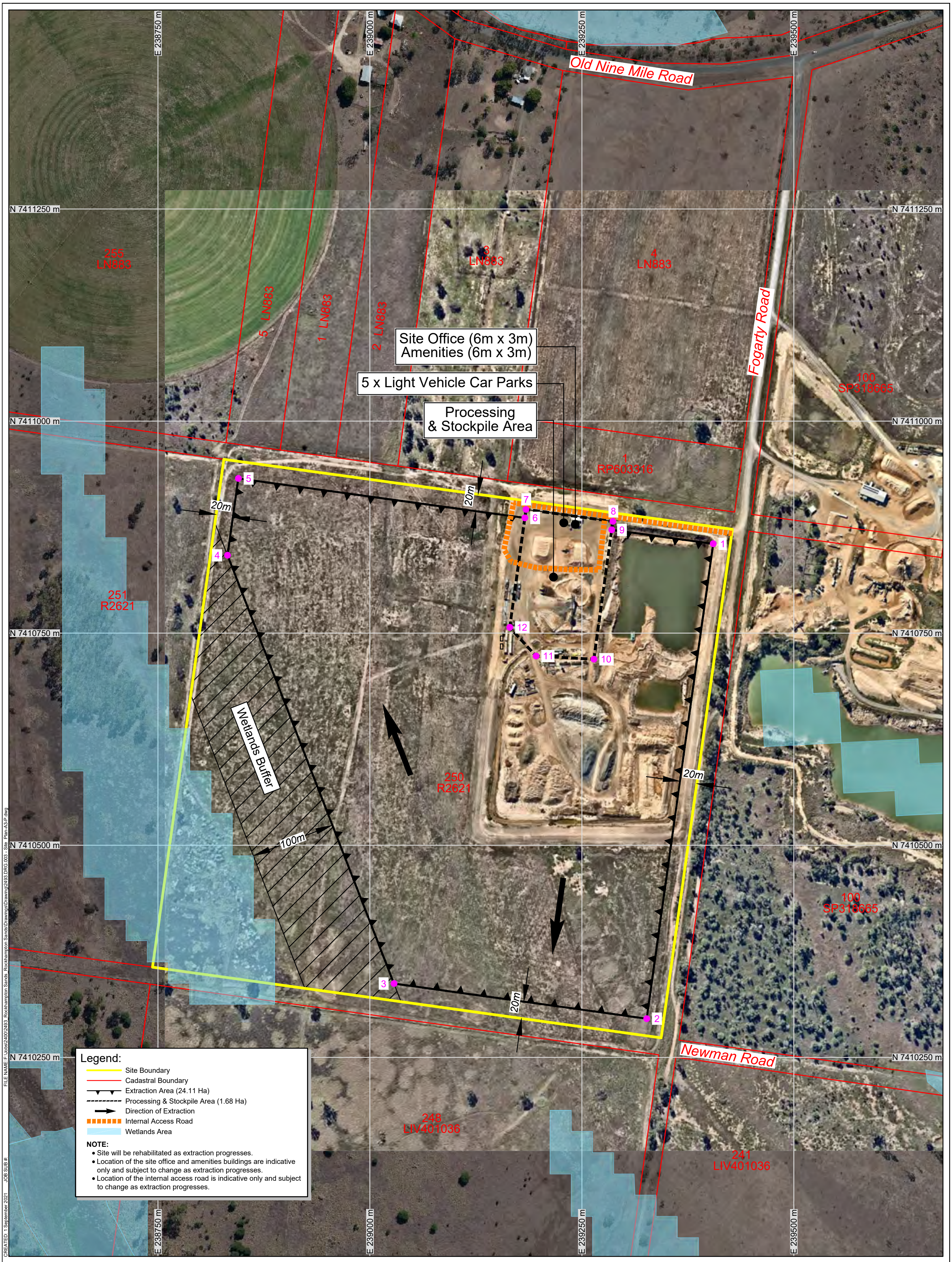
An assessment of potential contributions for impacts on SCRs associated with the Proposal has been undertaken in accordance with DTMR's "*Guide to Traffic Impact Assessment*". The calculated pavement contributions for impacts on SCRs associated with Stage 1 and Stage 2 of the Proposal are outlined in Table 8–1 and Table 8–2.

Conclusion

Based on the assessment and recommendations within this report, the Proposal can be approved from a traffic engineering perspective, with reasonable and relevant conditions.

Appendix A

Site Layout Plan



REV	DESCRIPTION	DATE	BY

Data Sources:
Photography: Nearmap Imagery_Captured 2021-July-10
Topography:
Cadastre: QSC_Rockhampton Regional DCDB Extract_2021-06-27 (publication)
Ecosystem:
Other: QLD Spatial Data Catalogue

N

PROJECT: Rockhampton Sands Quarry

CLIENT: Nine Mile Sands Pty Ltd

TITLE: Site Layout Plan

GROUNDWORK plus
PH: +61 7 3871 0411
WWW.GROUNDWORK.COM.AU

SCALE: 1: 4,000 When Printed On A3 — 0 80m

DRAWING NUMBER: 2493.DRG.003

REVISION:

DATE: 1 September 2021 | DRAWN: MRescar
PRINTED: 1 September 2021 | CHECKED: SLyons

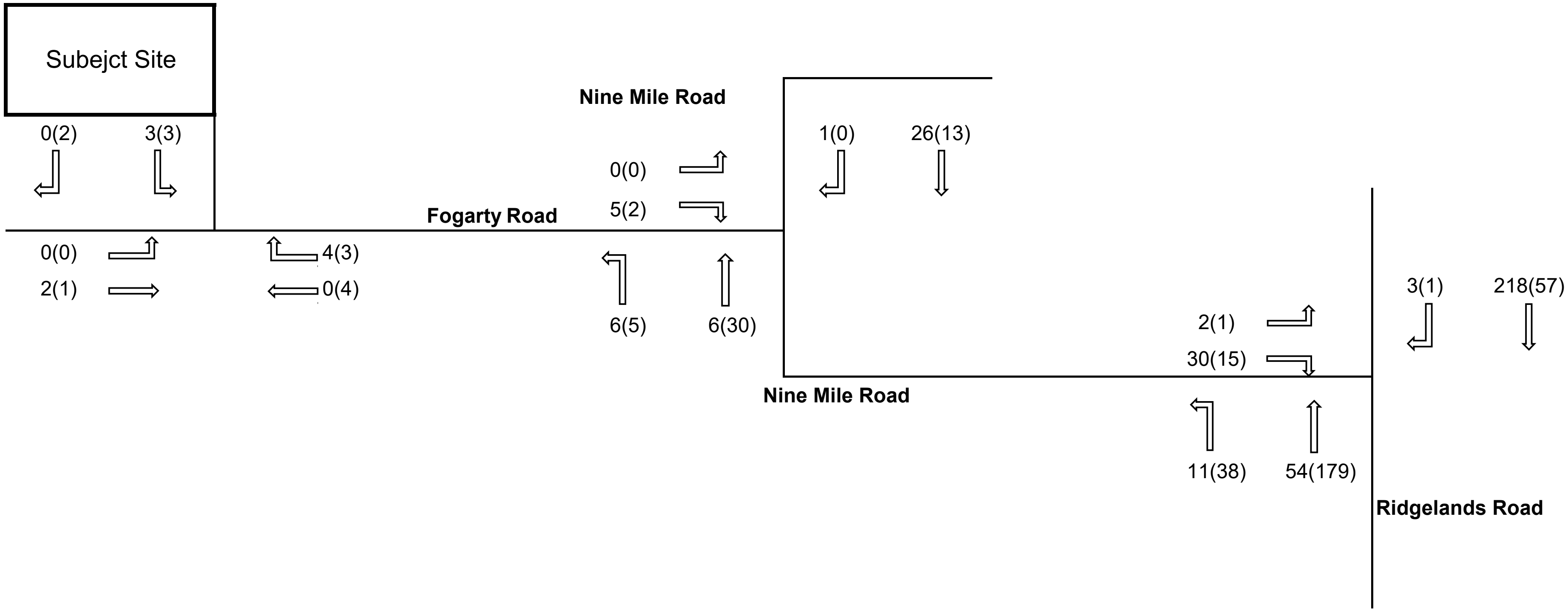
DATUM: HORIZONTAL / VERTICAL / ZONE
GDA94 / MGA / AHD / 56

Appendix B

Traffic Volume Diagrams

Note:

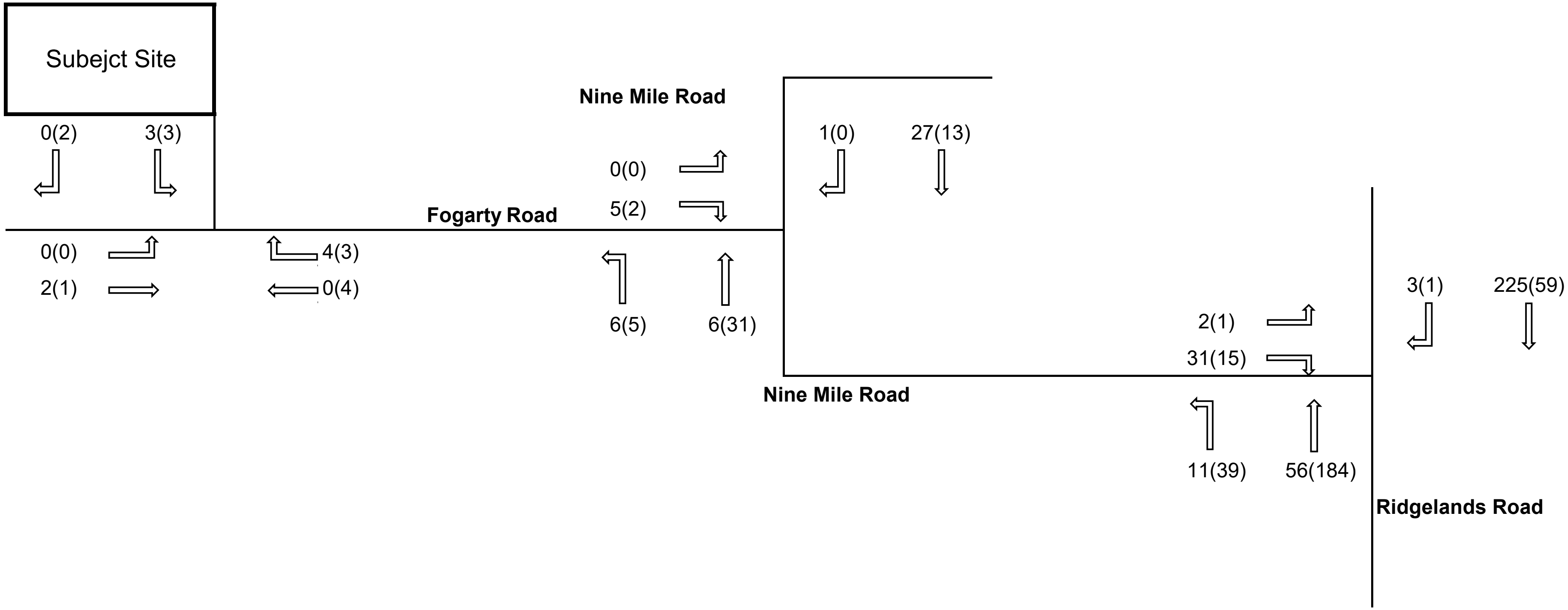
1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



Rockhampton Sands Quarry	**2021 Observed AM and PM Peak Hour Traffic Volumes**	April 2022 TTPlus Project No: 10574
	Figure B1	TRAFFIC TRANSPORT plus

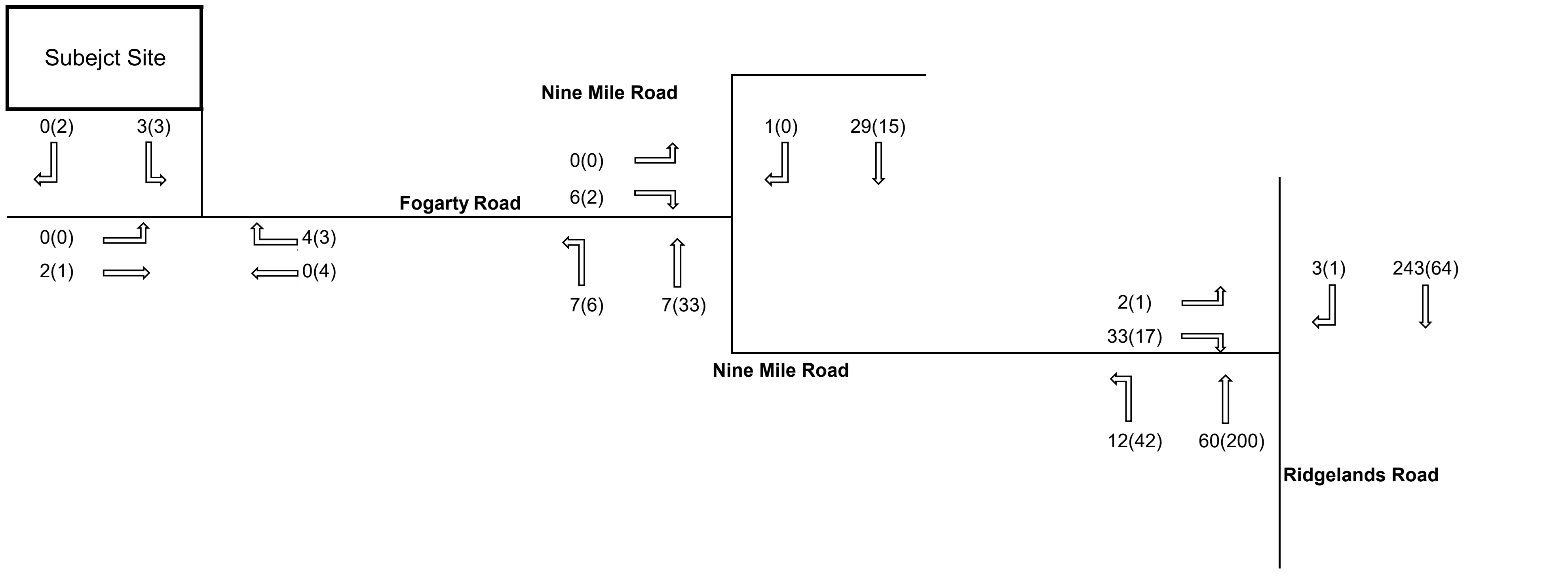
Note:

1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



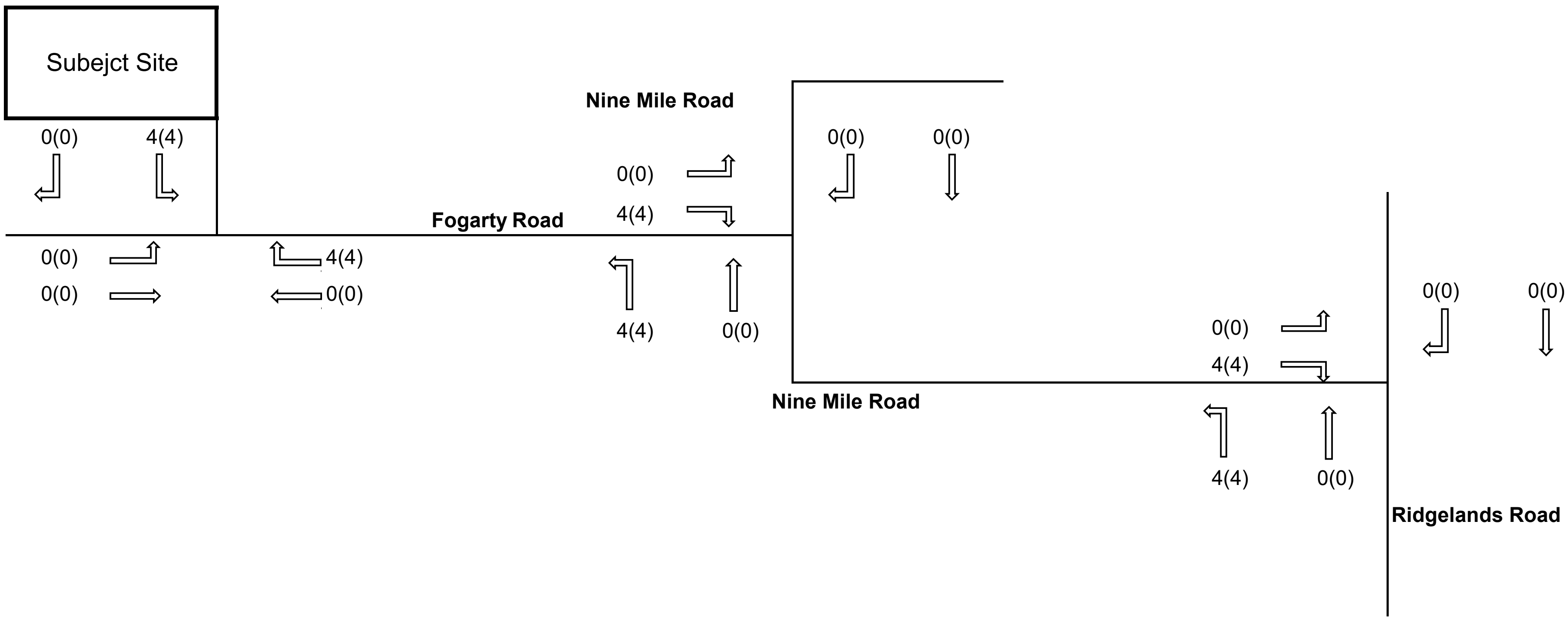
Rockhampton Sands Quarry	**2024 Base AM and PM Peak Hour Traffic Volumes**	April 2022 TTPlus Project No: 10574
	Figure B2	TRAFFIC TRANSPORT plus

Note:
1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



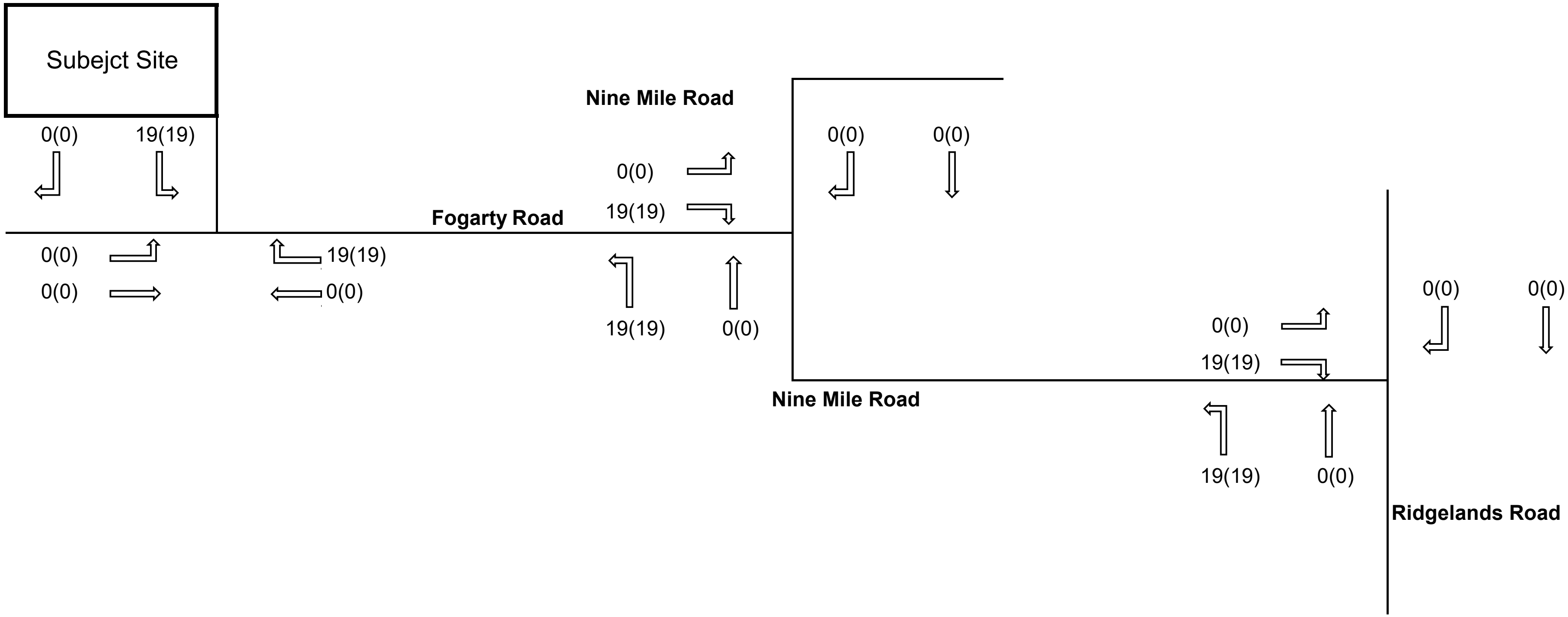
Rockhampton Sands Quarry	**2032 Base AM and PM Peak Hour Traffic Volumes**	April 2022 TTPlus Project No: 10574
	Figure B3	TRAFFIC TRANSPORT plus

Note:
1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



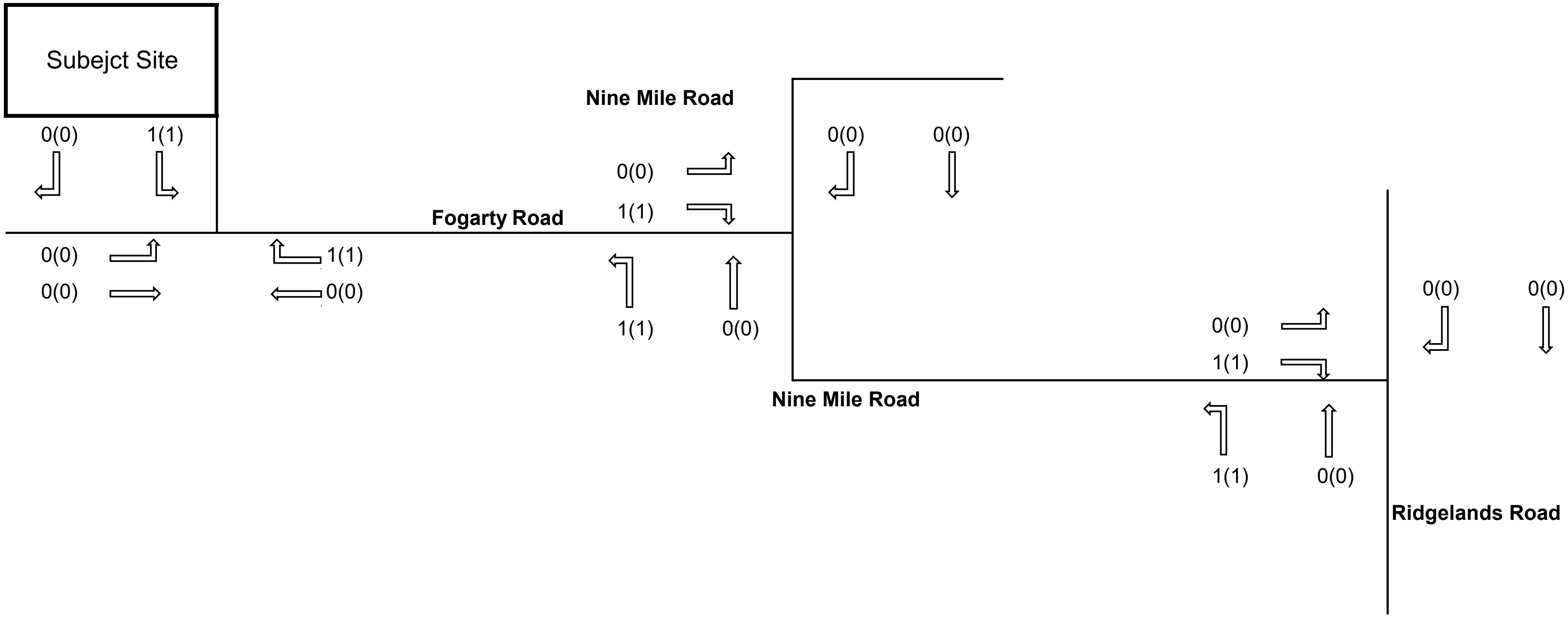
Rockhampton Sands Quarry	**Additional Truck Trips to the General Market**	April 2022 TTPlus Project No: 10574
	Figure B4	TRAFFIC TRANSPORT plus

Note:
1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



Rockhampton Sands Quarry	**Additional Truck Trips to the RRR Project**	April 2022 TTPlus Project No: 10574
	Figure B5	TRAFFIC TRANSPORT plus

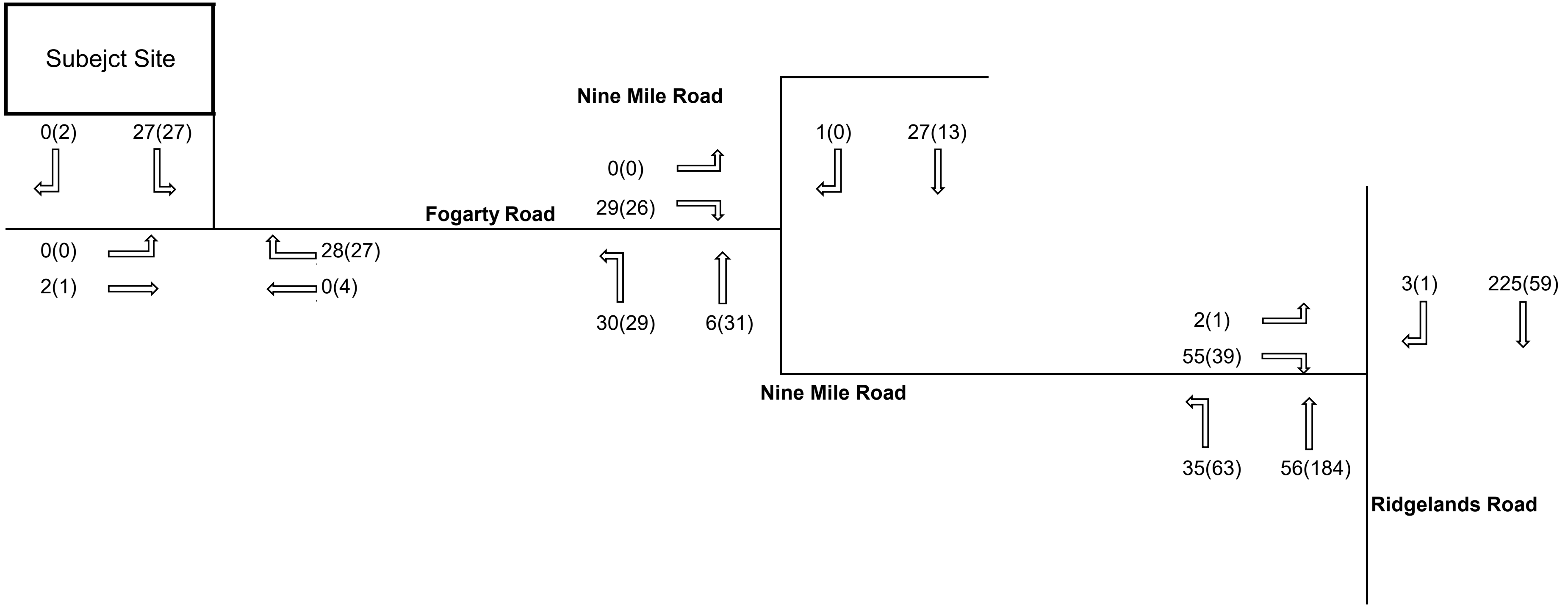
Note:
1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



Rockhampton Sands Quarry	**Additional Car Trips**	April 2022 TTPlus Project No: 10574
	Figure B6	TRAFFIC TRANSPORT plus

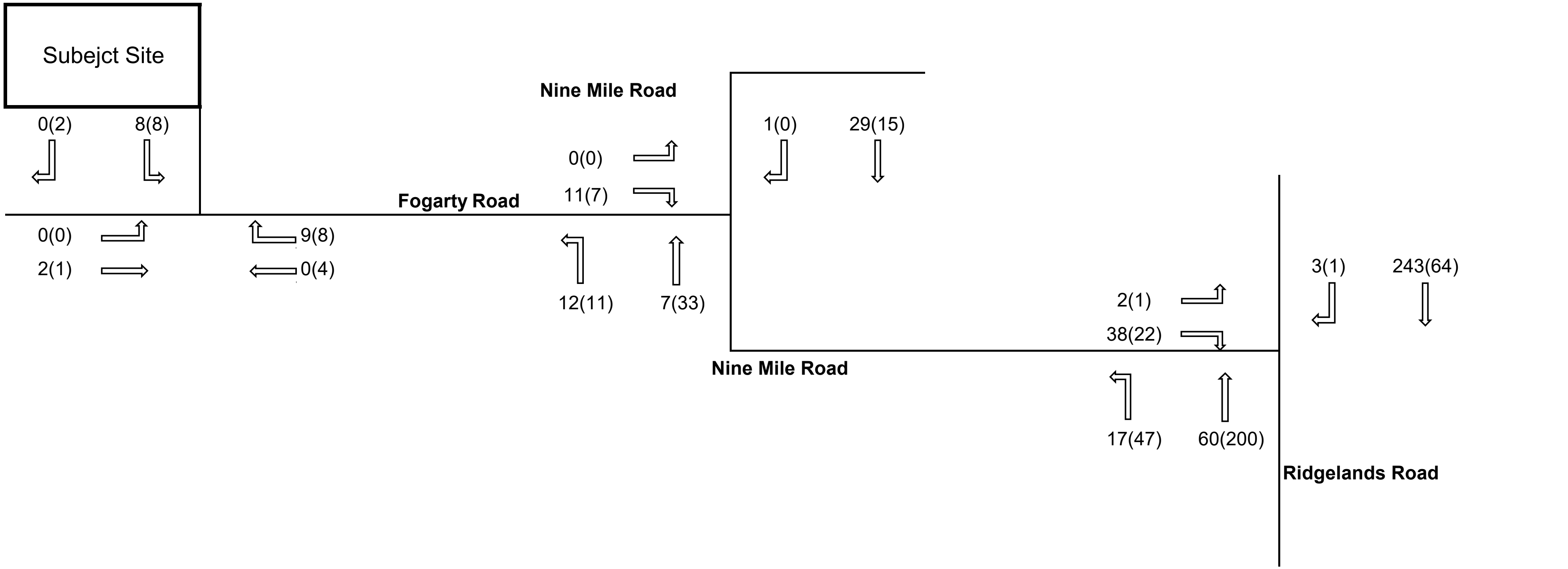
Note:

1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



Rockhampton Sands Quarry	**2024 Design AM and PM Peak Hour Traffic Volumes**	April 2022 TTPlus Project No: 10574
	Figure B7	TRAFFIC TRANSPORT plus

Note:
1. all units are vehicles per hour
2. 20 (30) = Weekday AM peak hour traffic volume (Weekday PM peak hour traffic volume)



Rockhampton Sands Quarry	**2032 AM and PM Design Traffic Volumes**	April 2022 TTPlus Project No: 10574
	Figure B8	TRAFFIC TRANSPORT plus

Appendix C

Results of SIDRA Analyses

MOVEMENT SUMMARY

Site: 101 [2024 Base AM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.19	0.00	54.0
2	T1	2	20.0	2	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	59.4
Approach		3	40.0	3	40.0	0.002	2.2	NA	0.0	0.0	0.00	0.19	0.00	57.5
North: Fogarty Road														
8	T1	1	20.0	1	20.0	0.004	0.0	LOS A	0.0	0.2	0.03	0.47	0.03	57.3
9	R2	4	80.0	4	80.0	0.004	6.4	LOS A	0.0	0.2	0.03	0.47	0.03	51.5
Approach		5	68.0	5	68.0	0.004	5.2	NA	0.0	0.2	0.03	0.47	0.03	52.6
West: Site Access														
10	L2	3	80.0	3	80.0	0.004	6.5	LOS A	0.0	0.2	0.02	0.57	0.02	50.3
12	R2	1	80.0	1	80.0	0.004	6.5	LOS A	0.0	0.2	0.02	0.57	0.02	49.6
Approach		4	80.0	4	80.0	0.004	6.5	LOS A	0.0	0.2	0.02	0.57	0.02	50.2
All Vehicles		12	65.0	13	65.0	0.004	4.8	NA	0.0	0.2	0.02	0.43	0.02	52.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2024 Base PM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.28	0.00	53.6
2	T1	1	20.0	1	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.28	0.00	58.9
Approach		2	50.0	2	50.0	0.002	3.2	NA	0.0	0.0	0.00	0.28	0.00	56.2
North: Fogarty Road														
8	T1	4	20.0	4	20.0	0.005	0.0	LOS A	0.0	0.2	0.02	0.26	0.02	59.1
9	R2	3	80.0	3	80.0	0.005	6.4	LOS A	0.0	0.2	0.02	0.26	0.02	53.0
Approach		7	45.7	7	45.7	0.005	2.8	NA	0.0	0.2	0.02	0.26	0.02	56.3
West: Site Access														
10	L2	3	80.0	3	80.0	0.005	6.5	LOS A	0.0	0.2	0.01	0.58	0.01	50.4
12	R2	2	80.0	2	80.0	0.005	6.5	LOS A	0.0	0.2	0.01	0.58	0.01	49.7
Approach		5	80.0	5	80.0	0.005	6.5	LOS A	0.0	0.2	0.01	0.58	0.01	50.1
All Vehicles		14	58.6	15	58.6	0.005	4.2	NA	0.0	0.2	0.02	0.37	0.02	53.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2024 Design AM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.19	0.00	54.0
2	T1	2	20.0	2	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	59.4
Approach		3	40.0	3	40.0	0.002	2.2	NA	0.0	0.0	0.00	0.19	0.00	57.5
North: Fogarty Road														
8	T1	1	20.0	1	20.0	0.024	0.0	LOS A	0.1	1.3	0.03	0.57	0.03	55.5
9	R2	28	80.0	29	80.0	0.024	6.4	LOS A	0.1	1.3	0.03	0.57	0.03	50.1
Approach		29	77.9	31	77.9	0.024	6.2	NA	0.1	1.3	0.03	0.57	0.03	50.3
West: Site Access														
10	L2	27	80.0	28	80.0	0.026	6.5	LOS A	0.1	1.2	0.02	0.56	0.02	50.3
12	R2	1	80.0	1	80.0	0.026	6.7	LOS A	0.1	1.2	0.02	0.56	0.02	49.6
Approach		28	80.0	29	80.0	0.026	6.5	LOS A	0.1	1.2	0.02	0.56	0.02	50.3
All Vehicles		60	77.0	63	77.0	0.026	6.1	NA	0.1	1.3	0.03	0.54	0.03	50.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2024 Design PM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.28	0.00	53.6
2	T1	1	20.0	1	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.28	0.00	58.9
Approach		2	50.0	2	50.0	0.002	3.2	NA	0.0	0.0	0.00	0.28	0.00	56.2
North: Fogarty Road														
8	T1	4	20.0	4	20.0	0.026	0.0	LOS A	0.1	1.3	0.03	0.52	0.03	56.7
9	R2	27	80.0	28	80.0	0.026	6.4	LOS A	0.1	1.3	0.03	0.52	0.03	51.0
Approach		31	72.3	33	72.3	0.026	5.6	NA	0.1	1.3	0.03	0.52	0.03	51.7
West: Site Access														
10	L2	27	80.0	28	80.0	0.027	6.5	LOS A	0.1	1.2	0.01	0.56	0.01	50.4
12	R2	2	80.0	2	80.0	0.027	6.7	LOS A	0.1	1.2	0.01	0.56	0.01	49.7
Approach		29	80.0	31	80.0	0.027	6.5	LOS A	0.1	1.2	0.01	0.56	0.01	50.3
All Vehicles		62	75.2	65	75.2	0.027	5.9	NA	0.1	1.3	0.02	0.53	0.02	51.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032 Base AM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.19	0.00	54.0
2	T1	2	20.0	2	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	59.4
Approach		3	40.0	3	40.0	0.002	2.2	NA	0.0	0.0	0.00	0.19	0.00	57.5
North: Fogarty Road														
8	T1	1	20.0	1	20.0	0.004	0.0	LOS A	0.0	0.2	0.03	0.47	0.03	57.3
9	R2	4	80.0	4	80.0	0.004	6.4	LOS A	0.0	0.2	0.03	0.47	0.03	51.5
Approach		5	68.0	5	68.0	0.004	5.2	NA	0.0	0.2	0.03	0.47	0.03	52.6
West: Site Access														
10	L2	3	80.0	3	80.0	0.004	6.5	LOS A	0.0	0.2	0.02	0.57	0.02	50.3
12	R2	1	80.0	1	80.0	0.004	6.5	LOS A	0.0	0.2	0.02	0.57	0.02	49.6
Approach		4	80.0	4	80.0	0.004	6.5	LOS A	0.0	0.2	0.02	0.57	0.02	50.2
All Vehicles		12	65.0	13	65.0	0.004	4.8	NA	0.0	0.2	0.02	0.43	0.02	52.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032 Base PM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.28	0.00	53.6
2	T1	1	20.0	1	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.28	0.00	58.9
Approach		2	50.0	2	50.0	0.002	3.2	NA	0.0	0.0	0.00	0.28	0.00	56.2
North: Fogarty Road														
8	T1	4	20.0	4	20.0	0.005	0.0	LOS A	0.0	0.2	0.02	0.26	0.02	59.1
9	R2	3	80.0	3	80.0	0.005	6.4	LOS A	0.0	0.2	0.02	0.26	0.02	53.0
Approach		7	45.7	7	45.7	0.005	2.8	NA	0.0	0.2	0.02	0.26	0.02	56.3
West: Site Access														
10	L2	3	80.0	3	80.0	0.005	6.5	LOS A	0.0	0.2	0.01	0.58	0.01	50.4
12	R2	2	80.0	2	80.0	0.005	6.5	LOS A	0.0	0.2	0.01	0.58	0.01	49.7
Approach		5	80.0	5	80.0	0.005	6.5	LOS A	0.0	0.2	0.01	0.58	0.01	50.1
All Vehicles		14	58.6	15	58.6	0.005	4.2	NA	0.0	0.2	0.02	0.37	0.02	53.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032 Design AM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.19	0.00	54.0
2	T1	2	20.0	2	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	59.4
Approach		3	40.0	3	40.0	0.002	2.2	NA	0.0	0.0	0.00	0.19	0.00	57.5
North: Fogarty Road														
8	T1	1	20.0	1	20.0	0.008	0.0	LOS A	0.0	0.4	0.03	0.53	0.03	56.4
9	R2	9	80.0	9	80.0	0.008	6.4	LOS A	0.0	0.4	0.03	0.53	0.03	50.8
Approach		10	74.0	11	74.0	0.008	5.8	NA	0.0	0.4	0.03	0.53	0.03	51.3
West: Site Access														
10	L2	8	80.0	8	80.0	0.008	6.5	LOS A	0.0	0.4	0.02	0.56	0.02	50.3
12	R2	1	80.0	1	80.0	0.008	6.5	LOS A	0.0	0.4	0.02	0.56	0.02	49.6
Approach		9	80.0	9	80.0	0.008	6.5	LOS A	0.0	0.4	0.02	0.56	0.02	50.3
All Vehicles		22	71.8	23	71.8	0.008	5.6	NA	0.0	0.4	0.02	0.50	0.02	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2032 Design PM Peak Hour (Site Folder: General)]

Fogarty Road Site Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.002	6.5	LOS A	0.0	0.0	0.00	0.28	0.00	53.6
2	T1	1	20.0	1	20.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.28	0.00	58.9
Approach		2	50.0	2	50.0	0.002	3.2	NA	0.0	0.0	0.00	0.28	0.00	56.2
North: Fogarty Road														
8	T1	4	20.0	4	20.0	0.010	0.0	LOS A	0.0	0.5	0.03	0.40	0.03	58.2
9	R2	8	80.0	8	80.0	0.010	6.4	LOS A	0.0	0.5	0.03	0.40	0.03	52.2
Approach		12	60.0	13	60.0	0.010	4.3	NA	0.0	0.5	0.03	0.40	0.03	54.1
West: Site Access														
10	L2	8	80.0	8	80.0	0.010	6.5	LOS A	0.0	0.4	0.01	0.57	0.01	50.4
12	R2	2	80.0	2	80.0	0.010	6.5	LOS A	0.0	0.4	0.01	0.57	0.01	49.7
Approach		10	80.0	11	80.0	0.010	6.5	LOS A	0.0	0.4	0.01	0.57	0.01	50.2
All Vehicles		24	67.5	25	67.5	0.010	5.1	NA	0.0	0.5	0.02	0.46	0.02	52.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2024 Base AM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.007	6.5	LOS A	0.0	0.3	0.07	0.58	0.07	50.2
3	R2	5	80.0	5	80.0	0.007	6.7	LOS A	0.0	0.3	0.07	0.58	0.07	49.5
Approach		6	80.0	6	80.0	0.007	6.6	LOS A	0.0	0.3	0.07	0.58	0.07	49.6
East: Nine Mile Road														
4	L2	6	80.0	6	80.0	0.009	6.5	LOS A	0.0	0.0	0.00	0.28	0.00	53.6
5	T1	6	20.0	6	20.0	0.009	0.0	LOS A	0.0	0.0	0.00	0.28	0.00	58.9
Approach		12	50.0	13	50.0	0.009	3.2	NA	0.0	0.0	0.00	0.28	0.00	56.2
West: Nine Mile Road														
11	T1	27	20.0	28	20.0	0.018	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.9
12	R2	1	80.0	1	80.0	0.018	6.5	LOS A	0.0	0.1	0.01	0.02	0.01	53.6
Approach		28	22.1	29	22.1	0.018	0.2	NA	0.0	0.1	0.01	0.02	0.01	59.7
All Vehicles		46	37.0	48	37.0	0.018	1.9	NA	0.0	0.3	0.01	0.16	0.01	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2024 Base PM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.003	6.6	LOS A	0.0	0.1	0.13	0.55	0.13	50.1
3	R2	2	80.0	2	80.0	0.003	6.7	LOS A	0.0	0.1	0.13	0.55	0.13	49.4
Approach		3	80.0	3	80.0	0.003	6.7	LOS A	0.0	0.1	0.13	0.55	0.13	49.6
East: Nine Mile Road														
4	L2	5	80.0	5	80.0	0.023	6.5	LOS A	0.0	0.0	0.00	0.08	0.00	54.3
5	T1	31	20.0	33	20.0	0.023	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	59.8
Approach		36	28.3	38	28.3	0.023	0.9	NA	0.0	0.0	0.00	0.08	0.00	59.0
West: Nine Mile Road														
11	T1	13	20.0	14	20.0	0.009	0.0	LOS A	0.0	0.1	0.03	0.04	0.03	59.8
12	R2	1	80.0	1	80.0	0.009	6.6	LOS A	0.0	0.1	0.03	0.04	0.03	53.5
Approach		14	24.3	15	24.3	0.009	0.5	NA	0.0	0.1	0.03	0.04	0.03	59.3
All Vehicles		53	30.2	56	30.2	0.023	1.1	NA	0.0	0.1	0.01	0.10	0.01	58.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2024 Design AM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.037	6.5	LOS A	0.1	1.4	0.13	0.58	0.13	50.1
3	R2	29	80.0	31	80.0	0.037	6.8	LOS A	0.1	1.4	0.13	0.58	0.13	49.4
Approach		30	80.0	32	80.0	0.037	6.8	LOS A	0.1	1.4	0.13	0.58	0.13	49.4
East: Nine Mile Road														
4	L2	30	80.0	32	80.0	0.030	6.5	LOS A	0.0	0.0	0.00	0.47	0.00	52.1
5	T1	6	20.0	6	20.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.47	0.00	57.1
Approach		36	70.0	38	70.0	0.030	5.4	NA	0.0	0.0	0.00	0.47	0.00	52.9
West: Nine Mile Road														
11	T1	27	20.0	28	20.0	0.018	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.9
12	R2	1	80.0	1	80.0	0.018	6.7	LOS A	0.0	0.1	0.01	0.02	0.01	53.6
Approach		28	22.1	29	22.1	0.018	0.3	NA	0.0	0.1	0.01	0.02	0.01	59.6
All Vehicles		94	58.9	99	58.9	0.037	4.3	NA	0.1	1.4	0.05	0.37	0.05	53.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2024 Design PM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.033	6.7	LOS A	0.1	1.3	0.17	0.57	0.17	50.0
3	R2	26	80.0	27	80.0	0.033	6.9	LOS A	0.1	1.3	0.17	0.57	0.17	49.3
Approach		27	80.0	28	80.0	0.033	6.9	LOS A	0.1	1.3	0.17	0.57	0.17	49.3
East: Nine Mile Road														
4	L2	29	80.0	31	80.0	0.045	6.5	LOS A	0.0	0.0	0.00	0.27	0.00	53.7
5	T1	31	20.0	33	20.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.27	0.00	59.0
Approach		60	49.0	63	49.0	0.045	3.1	NA	0.0	0.0	0.00	0.27	0.00	56.3
West: Nine Mile Road														
11	T1	13	20.0	14	20.0	0.009	0.0	LOS A	0.0	0.1	0.04	0.04	0.04	59.7
12	R2	1	80.0	1	80.0	0.009	6.8	LOS A	0.0	0.1	0.04	0.04	0.04	53.5
Approach		14	24.3	15	24.3	0.009	0.5	NA	0.0	0.1	0.04	0.04	0.04	59.2
All Vehicles		101	53.9	106	53.9	0.045	3.8	NA	0.1	1.3	0.05	0.32	0.05	54.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2032 Base AM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.008	6.5	LOS A	0.0	0.3	0.08	0.57	0.08	50.2
3	R2	6	80.0	6	80.0	0.008	6.7	LOS A	0.0	0.3	0.08	0.57	0.08	49.5
Approach		7	80.0	7	80.0	0.008	6.7	LOS A	0.0	0.3	0.08	0.57	0.08	49.6
East: Nine Mile Road														
4	L2	7	80.0	7	80.0	0.011	6.5	LOS A	0.0	0.0	0.00	0.28	0.00	53.6
5	T1	7	20.0	7	20.0	0.011	0.0	LOS A	0.0	0.0	0.00	0.28	0.00	58.9
Approach		14	50.0	15	50.0	0.011	3.2	NA	0.0	0.0	0.00	0.28	0.00	56.2
West: Nine Mile Road														
11	T1	29	20.0	31	20.0	0.019	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.9
12	R2	1	80.0	1	80.0	0.019	6.5	LOS A	0.0	0.1	0.01	0.02	0.01	53.6
Approach		30	22.0	32	22.0	0.019	0.2	NA	0.0	0.1	0.01	0.02	0.01	59.7
All Vehicles		51	37.6	54	37.6	0.019	1.9	NA	0.0	0.3	0.02	0.17	0.02	57.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2032 Base PM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.003	6.7	LOS A	0.0	0.1	0.14	0.55	0.14	50.0
3	R2	2	80.0	2	80.0	0.003	6.8	LOS A	0.0	0.1	0.14	0.55	0.14	49.4
Approach		3	80.0	3	80.0	0.003	6.7	LOS A	0.0	0.1	0.14	0.55	0.14	49.6
East: Nine Mile Road														
4	L2	6	80.0	6	80.0	0.025	6.5	LOS A	0.0	0.0	0.00	0.09	0.00	54.3
5	T1	33	20.0	35	20.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	59.7
Approach		39	29.2	41	29.2	0.025	1.0	NA	0.0	0.0	0.00	0.09	0.00	58.8
West: Nine Mile Road														
11	T1	15	20.0	16	20.0	0.010	0.0	LOS A	0.0	0.1	0.02	0.04	0.02	59.8
12	R2	1	80.0	1	80.0	0.010	6.7	LOS A	0.0	0.1	0.02	0.04	0.02	53.5
Approach		16	23.8	17	23.8	0.010	0.4	NA	0.0	0.1	0.02	0.04	0.02	59.4
All Vehicles		58	30.3	61	30.3	0.025	1.1	NA	0.0	0.1	0.01	0.10	0.01	58.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2032 Design AM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.014	6.5	LOS A	0.0	0.5	0.10	0.58	0.10	50.2
3	R2	11	80.0	12	80.0	0.014	6.7	LOS A	0.0	0.5	0.10	0.58	0.10	49.5
Approach		12	80.0	13	80.0	0.014	6.7	LOS A	0.0	0.5	0.10	0.58	0.10	49.5
East: Nine Mile Road														
4	L2	12	80.0	13	80.0	0.015	6.5	LOS A	0.0	0.0	0.00	0.36	0.00	53.2
5	T1	7	20.0	7	20.0	0.015	0.0	LOS A	0.0	0.0	0.00	0.36	0.00	58.4
Approach		19	57.9	20	57.9	0.015	4.1	NA	0.0	0.0	0.00	0.36	0.00	55.0
West: Nine Mile Road														
11	T1	29	20.0	31	20.0	0.019	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.9
12	R2	1	80.0	1	80.0	0.019	6.6	LOS A	0.0	0.1	0.01	0.02	0.01	53.6
Approach		30	22.0	32	22.0	0.019	0.2	NA	0.0	0.1	0.01	0.02	0.01	59.7
All Vehicles		61	44.6	64	44.6	0.019	2.7	NA	0.0	0.5	0.02	0.23	0.02	55.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [2032 Design AM Peak Hour (Site Folder: General)]

Nine Mile Road / Fogarty Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fogarty Road														
1	L2	1	80.0	1	80.0	0.014	6.5	LOS A	0.0	0.5	0.10	0.58	0.10	50.2
3	R2	11	80.0	12	80.0	0.014	6.7	LOS A	0.0	0.5	0.10	0.58	0.10	49.5
Approach		12	80.0	13	80.0	0.014	6.7	LOS A	0.0	0.5	0.10	0.58	0.10	49.5
East: Nine Mile Road														
4	L2	12	80.0	13	80.0	0.015	6.5	LOS A	0.0	0.0	0.00	0.36	0.00	53.2
5	T1	7	20.0	7	20.0	0.015	0.0	LOS A	0.0	0.0	0.00	0.36	0.00	58.4
Approach		19	57.9	20	57.9	0.015	4.1	NA	0.0	0.0	0.00	0.36	0.00	55.0
West: Nine Mile Road														
11	T1	29	20.0	31	20.0	0.019	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.9
12	R2	1	80.0	1	80.0	0.019	6.6	LOS A	0.0	0.1	0.01	0.02	0.01	53.6
Approach		30	22.0	32	22.0	0.019	0.2	NA	0.0	0.1	0.01	0.02	0.01	59.7
All Vehicles		61	44.6	64	44.6	0.019	2.7	NA	0.0	0.5	0.02	0.23	0.02	55.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2024 Base AM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	2	80.0	2	80.0	0.069	6.8	LOS A	0.3	3.1	0.45	0.70	0.45	47.7
3	R2	31	80.0	33	80.0	0.069	10.8	LOS B	0.3	3.1	0.45	0.70	0.45	47.0
Approach		33	80.0	35	80.0	0.069	10.6	LOS B	0.3	3.1	0.45	0.70	0.45	47.1
East: Ridgelands Road														
4	L2	11	80.0	12	80.0	0.044	6.5	LOS A	0.0	0.0	0.00	0.09	0.00	54.3
5	T1	56	20.0	59	20.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	59.7
Approach		67	29.9	71	29.9	0.044	1.1	NA	0.0	0.0	0.00	0.09	0.00	58.8
West: Ridgelands Road														
11	T1	225	20.0	237	20.0	0.137	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	3	80.0	3	80.0	0.003	6.8	LOS A	0.0	0.1	0.21	0.54	0.21	49.2
Approach		228	20.8	240	20.8	0.137	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.8
All Vehicles		328	28.6	345	28.6	0.137	1.4	NA	0.3	3.1	0.05	0.09	0.05	58.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2024 Base PM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	1	80.0	1	80.0	0.032	7.8	LOS A	0.1	1.4	0.47	0.67	0.47	48.0
3	R2	15	80.0	16	80.0	0.032	10.2	LOS B	0.1	1.4	0.47	0.67	0.47	47.4
Approach		16	80.0	17	80.0	0.032	10.0	LOS B	0.1	1.4	0.47	0.67	0.47	47.4
East: Ridgelands Road														
4	L2	39	80.0	41	80.0	0.147	6.5	LOS A	0.0	0.0	0.00	0.10	0.00	54.3
5	T1	184	20.0	194	20.0	0.147	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	59.6
Approach		223	30.5	235	30.5	0.147	1.2	NA	0.0	0.0	0.00	0.10	0.00	58.6
West: Ridgelands Road														
11	T1	59	20.0	62	20.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	1	80.0	1	80.0	0.001	8.0	LOS A	0.0	0.1	0.42	0.54	0.42	48.6
Approach		60	21.0	63	21.0	0.036	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.8
All Vehicles		299	31.2	315	31.2	0.147	1.4	NA	0.1	1.4	0.03	0.11	0.03	58.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2024 Design AM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	2	80.0	2	80.0	0.124	6.8	LOS A	0.5	5.7	0.50	0.74	0.50	47.3
3	R2	55	80.0	58	80.0	0.124	11.3	LOS B	0.5	5.7	0.50	0.74	0.50	46.7
Approach		57	80.0	60	80.0	0.124	11.2	LOS B	0.5	5.7	0.50	0.74	0.50	46.7
East: Ridgelands Road														
4	L2	35	80.0	37	80.0	0.065	6.5	LOS A	0.0	0.0	0.00	0.22	0.00	53.9
5	T1	56	20.0	59	20.0	0.065	0.0	LOS A	0.0	0.0	0.00	0.22	0.00	59.2
Approach		91	43.1	96	43.1	0.065	2.5	NA	0.0	0.0	0.00	0.22	0.00	57.1
West: Ridgelands Road														
11	T1	225	20.0	237	20.0	0.137	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	3	80.0	3	80.0	0.003	7.0	LOS A	0.0	0.1	0.26	0.54	0.26	49.1
Approach		228	20.8	240	20.8	0.137	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.8
All Vehicles		376	35.2	396	35.2	0.137	2.4	NA	0.5	5.7	0.08	0.17	0.08	56.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2024 Design PM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	1	80.0	1	80.0	0.084	7.8	LOS A	0.3	3.8	0.50	0.72	0.50	47.6
3	R2	39	80.0	41	80.0	0.084	10.8	LOS B	0.3	3.8	0.50	0.72	0.50	47.0
Approach		40	80.0	42	80.0	0.084	10.7	LOS B	0.3	3.8	0.50	0.72	0.50	47.0
East: Ridgelands Road														
4	L2	63	80.0	66	80.0	0.168	6.5	LOS A	0.0	0.0	0.00	0.14	0.00	54.1
5	T1	184	20.0	194	20.0	0.168	0.1	LOS A	0.0	0.0	0.00	0.14	0.00	59.5
Approach		247	35.3	260	35.3	0.168	1.7	NA	0.0	0.0	0.00	0.14	0.00	58.0
West: Ridgelands Road														
11	T1	59	20.0	62	20.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	3	80.0	3	80.0	0.004	8.4	LOS A	0.0	0.2	0.45	0.57	0.45	48.4
Approach		62	22.9	65	22.9	0.036	0.4	NA	0.0	0.2	0.02	0.03	0.02	59.3
All Vehicles		349	38.2	367	38.2	0.168	2.5	NA	0.3	3.8	0.06	0.19	0.06	56.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2032 Base AM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	2	80.0	2	80.0	0.076	6.9	LOS A	0.3	3.4	0.47	0.72	0.47	47.4
3	R2	33	80.0	35	80.0	0.076	11.3	LOS B	0.3	3.4	0.47	0.72	0.47	46.7
Approach		35	80.0	37	80.0	0.076	11.1	LOS B	0.3	3.4	0.47	0.72	0.47	46.8
East: Ridgelands Road														
4	L2	12	80.0	13	80.0	0.047	6.5	LOS A	0.0	0.0	0.00	0.09	0.00	54.3
5	T1	60	20.0	63	20.0	0.047	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	59.7
Approach		72	30.0	76	30.0	0.047	1.1	NA	0.0	0.0	0.00	0.09	0.00	58.7
West: Ridgelands Road														
11	T1	243	20.0	256	20.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	3	80.0	3	80.0	0.003	6.9	LOS A	0.0	0.1	0.22	0.54	0.22	49.2
Approach		246	20.7	259	20.7	0.148	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.8
All Vehicles		353	28.5	372	28.5	0.148	1.4	NA	0.3	3.4	0.05	0.09	0.05	58.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2032 Base PM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	1	80.0	1	80.0	0.038	7.9	LOS A	0.1	1.7	0.49	0.69	0.49	47.7
3	R2	17	80.0	18	80.0	0.038	10.7	LOS B	0.1	1.7	0.49	0.69	0.49	47.1
Approach		18	80.0	19	80.0	0.038	10.5	LOS B	0.1	1.7	0.49	0.69	0.49	47.1
East: Ridgelands Road														
4	L2	42	80.0	44	80.0	0.159	6.5	LOS A	0.0	0.0	0.00	0.10	0.00	54.3
5	T1	200	20.0	211	20.0	0.159	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	59.6
Approach		242	30.4	255	30.4	0.159	1.2	NA	0.0	0.0	0.00	0.10	0.00	58.6
West: Ridgelands Road														
11	T1	64	20.0	67	20.0	0.039	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	1	80.0	1	80.0	0.001	8.2	LOS A	0.0	0.1	0.44	0.55	0.44	48.5
Approach		65	20.9	68	20.9	0.039	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.8
All Vehicles		325	31.3	342	31.3	0.159	1.5	NA	0.1	1.7	0.03	0.11	0.03	58.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2032 Design AM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	2	80.0	2	80.0	0.088	6.9	LOS A	0.3	3.9	0.48	0.73	0.48	47.3
3	R2	38	80.0	40	80.0	0.088	11.4	LOS B	0.3	3.9	0.48	0.73	0.48	46.7
Approach		40	80.0	42	80.0	0.088	11.2	LOS B	0.3	3.9	0.48	0.73	0.48	46.7
East: Ridgelands Road														
4	L2	17	80.0	18	80.0	0.052	6.5	LOS A	0.0	0.0	0.00	0.13	0.00	54.2
5	T1	60	20.0	63	20.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	59.6
Approach		77	33.2	81	33.2	0.052	1.4	NA	0.0	0.0	0.00	0.13	0.00	58.3
West: Ridgelands Road														
11	T1	243	20.0	256	20.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	3	80.0	3	80.0	0.003	6.9	LOS A	0.0	0.1	0.23	0.54	0.23	49.1
Approach		246	20.7	259	20.7	0.148	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.8
All Vehicles		363	29.9	382	29.9	0.148	1.6	NA	0.3	3.9	0.06	0.11	0.06	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 3 [2032 Design PM Peak Hour (Site Folder: General)]

Ridgelands Road / Nine Mile Road Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nine Mile Road														
1	L2	1	80.0	1	80.0	0.049	7.9	LOS A	0.2	2.1	0.50	0.70	0.50	47.6
3	R2	22	80.0	23	80.0	0.049	10.8	LOS B	0.2	2.1	0.50	0.70	0.50	47.0
Approach		23	80.0	24	80.0	0.049	10.7	LOS B	0.2	2.1	0.50	0.70	0.50	47.0
East: Ridgelands Road														
4	L2	47	80.0	49	80.0	0.164	6.5	LOS A	0.0	0.0	0.00	0.11	0.00	54.2
5	T1	200	20.0	211	20.0	0.164	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.6
Approach		247	31.4	260	31.4	0.164	1.3	NA	0.0	0.0	0.00	0.11	0.00	58.5
West: Ridgelands Road														
11	T1	64	20.0	67	20.0	0.039	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	1	80.0	1	80.0	0.001	8.3	LOS A	0.0	0.1	0.44	0.55	0.44	48.5
Approach		65	20.9	68	20.9	0.039	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.8
All Vehicles		335	32.7	353	32.7	0.164	1.7	NA	0.2	2.1	0.04	0.13	0.04	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix D

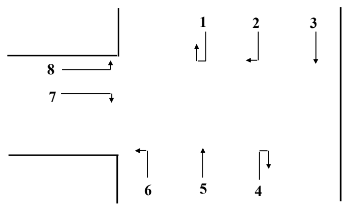
Results of Traffic Surveys

AUSTRAFFIC INTERSECTION COUNT

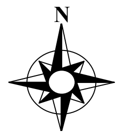
Site No.: 1 **Weather:** Fine
Location: Fogarty Road/Rockhampton Sands Site Access, Fairy Bower
Day/Date: Friday, 13 August 2021
AM Peak: *Hour ending - 7:30 AM*
PM Peak: *Hour ending - 5:30 PM*

Fogarty Road (no posted speed)

Rockhampton Sands Site Access (15km/h)



Fogarty Road (no posted speed)

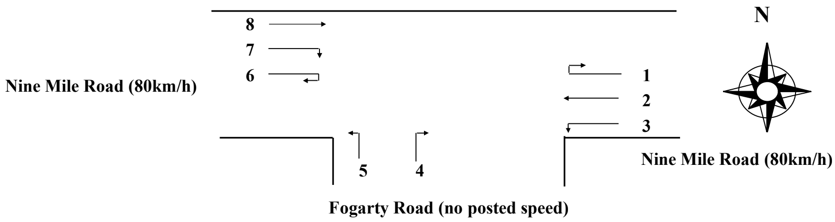


TIME (1/4 hr end)	Movement 1			Movement 2			Movement 3			Movement 4			Movement 5			Movement 6			Movement 7			Movement 8		
	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**
6:45 AM	0	0	**0**	1	1	**2**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	1	**1**
7:00 AM	0	0	**0**	0	1	**1**	0	0	**0**	0	0	**0**	0	1	**1**	0	0	**0**	0	0	**0**	0	0	**0**
7:15 AM	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	2	**2**
7:30 AM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
7:45 AM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
8:00 AM	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**
8:15 AM	0	0	**0**	3	0	**3**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**
8:30 AM	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
8:45 AM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
9:00 AM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**
9:15 AM	0	0	**0**	1	1	**2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
9:30 AM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	1	**1**
3 hr Total	**0**	**0**	**0**	**7**	**3**	**10**	**1**	**0**	**1**	**0**	**0**	**0**	**4**	**1**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**4**
AM Peak	**0**	**0**	**0**	**2**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**

TIME (1/4 hr end)	Movement 1			Movement 2			Movement 3			Movement 4			Movement 5			Movement 6			Movement 7			Movement 8		
	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**
2:45 PM	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
3:00 PM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**
3:15 PM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
3:30 PM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
3:45 PM	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
4:00 PM	0	0	**0**	0	1	**1**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	1	0	**1**
4:15 PM	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**
4:30 PM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
4:45 PM	0	0	**0**	2	0	**2**	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	1	0	**1**
5:00 PM	0	0	**0**	1	0	**1**	2	0	**2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**
5:15 PM	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	2	0	**2**	1	0	**1**
5:30 PM	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
5:45 PM	0	0	**0**	0	0	**0**	1	0	**1**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**
6:00 PM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	2	0	**2**	1	0	**1**
3.5 hr Total	**0**	**0**	**0**	**4**	**1**	**5**	**7**	**0**	**7**	**0**	**0**	**0**	**2**	**0**	**2**	**1**	**0**	**1**	**5**	**0**	**5**	**6**	**0**	**6**
PM Peak	**0**	**0**	**0**	**3**	**0**	**3**	**4**	**0**	**4**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**0**	**3**

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 2 **Weather:** Fine
Location: Fogarty Road/Nine Mile Road, Fairy Bower
Day/Date: Friday, 13 August 2021
AM Peak: *Hour ending - 8:30 AM*
PM Peak: *Hour ending - 4:00 PM*

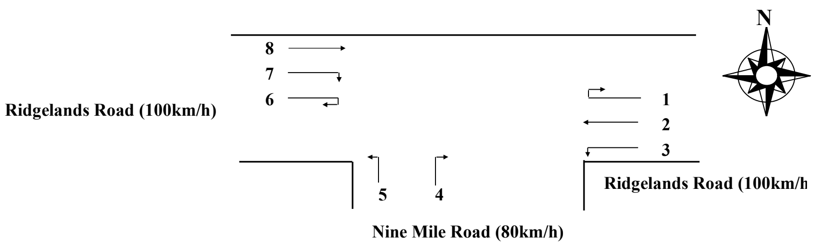


TIME (1/4 hr end)	Movement 1			Movement 2			Movement 3			Movement 4			Movement 5			Movement 6			Movement 7			Movement 8		
	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**
6:45 AM	0	0	**0**	1	1	**2**	1	1	**2**	1	1	**2**	0	1	**1**	0	0	**0**	0	1	**1**	2	0	**2**
7:00 AM	0	0	**0**	1	0	**1**	0	1	**1**	0	1	**1**	0	0	**0**	0	0	**0**	0	0	**0**	5	1	**6**
7:15 AM	0	0	**0**	0	0	**0**	0	1	**1**	0	2	**2**	0	0	**0**	0	0	**0**	1	0	**1**	1	1	**2**
7:30 AM	0	0	**0**	0	0	**0**	0	2	**2**	0	1	**1**	0	1	**1**	0	0	**0**	0	0	**0**	7	1	**8**
7:45 AM	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	5	0	**5**
8:00 AM	0	0	**0**	3	0	**3**	0	0	**0**	1	1	**2**	0	0	**0**	0	0	**0**	1	0	**1**	7	1	**8**
8:15 AM	0	0	**0**	1	0	**1**	4	1	**5**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	4	0	**4**
8:30 AM	0	0	**0**	2	0	**2**	1	0	**1**	1	1	**2**	0	0	**0**	0	0	**0**	0	0	**0**	9	0	**9**
8:45 AM	0	0	**0**	0	0	**0**	0	1	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	4	0	**4**
9:00 AM	0	0	**0**	2	0	**2**	1	0	**1**	1	1	**2**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**
9:15 AM	0	0	**0**	6	0	**6**	1	1	**2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
9:30 AM	0	0	**0**	2	0	**2**	1	2	**3**	0	1	**1**	0	0	**0**	0	0	**0**	0	0	**0**	6	0	**6**
3 hr Total	**0**	**0**	**0**	**18**	**1**	**19**	**9**	**10**	**19**	**5**	**9**	**14**	**0**	**2**	**2**	**0**	**0**	**0**	**2**	**1**	**3**	**51**	**4**	**55**
AM Peak	**0**	**0**	**0**	**6**	**0**	**6**	**5**	**1**	**6**	**3**	**2**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**25**	**1**	**26**

TIME (1/4 hr end)	Movement 1			Movement 2			Movement 3			Movement 4			Movement 5			Movement 6			Movement 7			Movement 8		
	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**	Light Vehicles	Heavy Vehicles	**Total**
2:45 PM	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**
3:00 PM	0	0	**0**	2	0	**2**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	3	1	**4**
3:15 PM	0	0	**0**	6	0	**6**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	2	1	**3**
3:30 PM	0	0	**0**	5	1	**6**	1	1	**2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	2	1	**3**
3:45 PM	0	0	**0**	11	1	**12**	1	0	**1**	0	1	**1**	0	0	**0**	0	0	**0**	0	0	**0**	4	0	**4**
4:00 PM	0	0	**0**	5	1	**6**	1	1	**2**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	3	0	**3**
4:15 PM	0	0	**0**	6	0	**6**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	2	0	**2**
4:30 PM	0	0	**0**	4	0	**4**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	4	1	**5**
4:45 PM	0	0	**0**	5	1	**6**	1	0	**1**	1	0	**1**	1	0	**1**	0	0	**0**	1	0	**1**	2	0	**2**
5:00 PM	0	0	**0**	7	0	**7**	1	0	**1**	3	0	**3**	0	0	**0**	0	0	**0**	0	0	**0**	2	0	**2**
5:15 PM	0	0	**0**	6	0	**6**	1	0	**1**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	2	0	**2**
5:30 PM	0	0	**0**	4	0	**4**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	4	0	**4**
5:45 PM	0	0	**0**	2	0	**2**	2	0	**2**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	5	0	**5**
6:00 PM	0	0	**0**	3	0	**3**	0	0	**0**	1	0	**1**	0	0	**0**	0	0	**0**	0	0	**0**	3	1	**4**
3.5 hr Total	**0**	**0**	**0**	**67**	**4**	**71**	**9**	**2**	**11**	**8**	**1**	**9**	**2**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**1**	**39**	**5**	**44**
PM Peak	**0**	**0**	**0**	**27**	**3**	**30**	**3**	**2**	**5**	**1**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**2**	**13**

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 3 **Weather:** Fine
Location: Nine Mile Road/Ridgelands Road, Fairy Bower
Day/Date: Friday, 13 August 2021
AM Peak: *Hour ending - 8:30 AM*
PM Peak: *Hour ending - 4:00 PM*



TIME (1/4 hr end)	Movement 1			Movement 2			Movement 3			Movement 4			Movement 5			Movement 6			Movement 7			Movement 8		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
6:45 AM	0	0	**0**	6	2	**8**	1	1	**2**	1	1	**2**	1	0	**1**	0	0	**0**	0	0	**0**	31	0	**31**
7:00 AM	0	0	**0**	10	1	**11**	1	1	**2**	5	1	**6**	0	1	**1**	0	0	**0**	0	0	**0**	24	1	**25**
7:15 AM	0	0	**0**	12	1	**13**	2	2	**4**	1	3	**4**	0	1	**1**	0	0	**0**	0	0	**0**	16	0	**16**
7:30 AM	0	0	**0**	9	5	**14**	0	0	**0**	8	2	**10**	1	0	**1**	0	0	**0**	0	1	**1**	29	1	**30**
7:45 AM	0	0	**0**	11	3	**14**	0	0	**0**	4	2	**6**	0	0	**0**	0	0	**0**	0	0	**0**	42	0	**42**
8:00 AM	0	0	**0**	10	4	**14**	3	0	**3**	7	2	**9**	0	0	**0**	0	0	**0**	0	0	**0**	71	2	**73**
8:15 AM	0	0	**0**	15	2	**17**	7	0	**7**	4	1	**5**	1	0	**1**	0	0	**0**	0	1	**1**	49	4	**53**
8:30 AM	0	0	**0**	7	2	**9**	1	0	**1**	10	0	**10**	1	0	**1**	0	0	**0**	2	0	**2**	49	1	**50**
8:45 AM	0	0	**0**	10	2	**12**	0	1	**1**	4	1	**5**	0	0	**0**	0	0	**0**	0	0	**0**	40	0	**40**
9:00 AM	0	0	**0**	11	3	**14**	6	0	**6**	3	1	**4**	0	0	**0**	0	0	**0**	0	0	**0**	25	0	**25**
9:15 AM	0	0	**0**	12	0	**12**	5	1	**6**	2	0	**2**	0	0	**0**	0	0	**0**	0	0	**0**	31	3	**34**
9:30 AM	0	0	**0**	16	1	**17**	1	2	**3**	4	0	**4**	2	0	**2**	0	0	**0**	1	0	**1**	17	3	**20**
3 hr Total	**0**	**0**	**0**	**129**	**26**	**155**	**27**	**8**	**35**	**53**	**14**	**67**	**6**	**2**	**8**	**0**	**0**	**0**	**3**	**2**	**5**	**424**	**15**	**439**
AM Peak	**0**	**0**	**0**	**43**	**11**	**54**	**11**	**0**	**11**	**25**	**5**	**30**	**2**	**0**	**2**	**0**	**0**	**0**	**2**	**1**	**3**	**211**	**7**	**218**

TIME (1/4 hr end)	Movement 1			Movement 2			Movement 3			Movement 4			Movement 5			Movement 6			Movement 7			Movement 8		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
2:45 PM	0	0	**0**	23	2	**25**	2	0	**2**	5	0	**5**	0	0	**0**	0	0	**0**	0	0	**0**	21	1	**22**
3:00 PM	0	0	**0**	27	1	**28**	3	1	**4**	4	0	**4**	0	0	**0**	0	0	**0**	0	0	**0**	25	0	**25**
3:15 PM	0	0	**0**	38	0	**38**	6	1	**7**	2	0	**2**	0	0	**0**	0	0	**0**	0	0	**0**	16	1	**17**
3:30 PM	0	0	**0**	33	4	**37**	7	2	**9**	0	0	**0**	0	0	**0**	0	0	**0**	1	0	**1**	18	1	**19**
3:45 PM	0	0	**0**	57	3	**60**	13	1	**14**	4	1	**5**	0	1	**1**	0	0	**0**	0	0	**0**	12	0	**12**
4:00 PM	0	0	**0**	42	2	**44**	7	1	**8**	6	0	**6**	0	0	**0**	0	0	**0**	0	0	**0**	9	0	**9**
4:15 PM	0	0	**0**	29	0	**29**	7	1	**8**	3	0	**3**	1	1	**2**	0	0	**0**	1	0	**1**	9	1	**10**
4:30 PM	0	0	**0**	44	2	**46**	5	0	**5**	4	1	**5**	1	0	**1**	0	0	**0**	0	0	**0**	12	2	**14**
4:45 PM	0	0	**0**	32	0	**32**	12	1	**13**	3	0	**3**	0	0	**0**	0	0	**0**	0	0	**0**	15	0	**15**
5:00 PM	0	0	**0**	30	2	**32**	8	0	**8**	6	0	**6**	0	0	**0**	0	0	**0**	0	0	**0**	21	1	**22**
5:15 PM	0	0	**0**	44	0	**44**	3	0	**3**	2	0	**2**	0	0	**0**	0	0	**0**	0	0	**0**	13	1	**14**
5:30 PM	0	0	**0**	40	0	**40**	6	0	**6**	3	1	**4**	0	0	**0**	0	0	**0**	0	0	**0**	12	0	**12**
5:45 PM	0	0	**0**	27	1	**28**	5	1	**6**	7	0	**7**	1	0	**1**	0	0	**0**	0	0	**0**	30	0	**30**
6:00 PM	0	0	**0**	21	0	**21**	4	0	**4**	5	1	**6**	0	0	**0**	0	0	**0**	0	0	**0**	17	1	**18**
3.5 hr Total	**0**	**0**	**0**	**487**	**17**	**504**	**88**	**9**	**97**	**54**	**4**	**58**	**3**	**2**	**5**	**0**	**0**	**0**	**2**	**0**	**2**	**230**	**9**	**239**
PM Peak	**0**	**0**	**0**	**170**	**9**	**179**	**33**	**5**	**38**	**12**	**1**	**13**	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**55**	**2**	**57**

Appendix E

Results of Pavement Contribution Assessment

250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Pavement Impact Assessment

The methodology of the pavement impact assessment is based on Department of Transport and Main Roads' Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment December 2018.

Step 1a: Project Parameters and Impact Potential Assessment Area (Material delivered to the General Market)

Total Production Rate (tpa):	700,000
Material (tpa) delivered to the General Market:	250,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	4%	0.5	0.9	0.020	0.143
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	32%	8.5	6.8	0.163	1.578
10	B-double	40.0	0.53	6.3	0.42	7.09	32%	12.8	6.8	0.170	2.016
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	32%	11.5	6.8	0.170	2.016
Total	-	-	-	-	-	-	100%	33.3	21.4	0.52	5.75

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

Contribution (cents / tonne):	10.10
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 1b: Project Parameters and Impact Potential Assessment Area (Material delivered to the RRR Project)

Total Production Rate (tpa):	700,000
Material (tpa) delivered to the RRR Project:	450,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	4,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0.0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	3.0%	0.4	1.2	0.015	0.107
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0.0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0.0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0.0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0.0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	50.0%	13.3	20.4	0.255	2.465
10	B-double	40.0	0.53	6.3	0.42	7.09	23.5%	9.4	9.6	0.125	1.481
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0.0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0.0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	23.5%	8.5	9.6	0.125	1.481
Total	-	-	-	-	-	-	100%	31.5	40.7	0.52	5.53

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 2: Road Asset Data from DTMR

							ARMIS TRAFFIC DATA				
						Sealed		2020			
Sect. No.	Road No.	Road Name	Road Sections	Ch	Ch	Length (km)	AADT 2020	HV %	Growth Adopt	AADT HV	SAR4 per HV
1	511	Ridgelands Road	towards Rockhampton	4.8	4.1	0.7	1557	13.69	1.0%	213.2	3.2
2	511	Ridgelands Road	towards Rockhampton (Point 6)	4.1	2.6	1.5	2892	9.23	1.0%	266.9	3.2
3	511	Ridgelands Road	towards Rockhampton	2.6	0.0	2.6	4022	7.61	1.0%	306.1	3.2
4	10E	Bruce Highway	to the Carpricorn Highway (south	0.0	1.4	1.4	14183	15.93	1.0%	2259.4	2.9
5	10E	Bruce Highway	to the Carpricorn Highway (south	1.4	4.3	2.9	19695	12.51	1.0%	2463.8	2.9
6	10E	Bruce Highway	to the Carpricorn Highway (south	4.3	5.5	1.2	19223	14.59	1.0%	2804.6	2.9
7	10F	Bruce Highway	to Rockhampton (north)	0.0	1.6	1.6	30049	10.54	1.0%	3167.2	2.9
8	10F	Bruce Highway	to Rockhampton (north)	1.6	4.3	2.7	22919	13.25	1.0%	3036.8	2.9
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Step 3: Calculate Background SAR4s

Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment states:

> The raw road asset data from TMR provides a two-way AADT with a heavy vehicle percentage for each identified road segment. Unfortunately, it is not feasible to calculate background SAR5s and SAR12s as the raw data does not capture loaded and unloaded heavy vehicle movements. As such, the scoping assessment is based on SAR4s (ESAs). This is a reasonable approach noting that 82% of the TMR network is sealed roads with granular pavement (SAR4 / ESA).

									Background SAR4s (Each Direction) Year by Year without Development										
Sect. No.	**Road No.**	**Road Name**	**Ch**	**Ch**	**2020 AADT per Dir.**	**2020 HV%**	**2020 HV per Dir.**	**SAR4 per HV**	**AADT year 2020**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	4.8	4.1	778.5	13.69	107	3.2	124482	126984	128253	129536	130831	132140	133461	134796	136144	137505	138880
2	511	Ridgelands Road	4.1	2.6	1446.0	9.23	133	3.2	155888	159021	160612	162218	163840	165478	167133	168804	170492	172197	173919
3	511	Ridgelands Road	2.6	0.0	2011.0	7.61	153	3.2	178747	182340	184164	186005	187865	189744	191641	193558	195493	197448	199423
4	10E	Bruce Highway	0.0	1.4	7091.5	15.93	1130	2.9	1195762	1219797	1231995	1244315	1256758	1269325	1282019	1294839	1307787	1320865	1334074
5	10E	Bruce Highway	1.4	4.3	9847.5	12.51	1232	2.9	1303990	1330200	1343502	1356937	1370506	1384211	1398053	1412034	1426154	1440416	1454820
6	10E	Bruce Highway	4.3	5.5	9611.5	14.59	1402	2.9	1484353	1514189	1529331	1544624	1560070	1575671	1591428	1607342	1623416	1639650	1656046
7	10F	Bruce Highway	0.0	1.6	15024.5	10.54	1584	2.9	1676222	1709914	1727013	1744283	1761726	1779343	1797137	1815108	1833259	1851592	1870108
8	10F	Bruce Highway	1.6	4.3	11459.5	13.25	1518	2.9	1607209	1639514	1655909	1672468	1689193	1706085	1723146	1740377	1757781	1775359	1793112
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250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the General Market)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	0.9	0.5	0	150	0.9	3.57	3	1071
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	6.8	0.51	3	1224	6.8	4.93	34	11837
10	B-double	6.8	0.53	4	1273	6.8	6.3	43	15126
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	6.8	0.53	4	1273	6.8	6.3	43	15126
Total	-	-	-	11	3920	-	-	123	43160

250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the RRR Project)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	1.2	0.5	1	214	1.2	3.57	4	1530
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	20.4	0.51	10	3643	20.4	4.93	100	35214
10	B-double	9.6	0.53	5	1779	9.6	6.3	60	21150
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	9.6	0.53	5	1779	9.6	6.3	60	21150
Total	-	-	-	21	7416	-	-	225	79044

250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 5a: Assign Development SAR4s onto the SCR Network (Material delivered to the General Market)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
3	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 5b: Assign Development SAR4s onto the SCR Network (Material delivered to the RRR Project)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	100%	7416	7416	7416	7416	7416	7416	7416	7416	7416	7416	79044	79044	79044	79044	79044	79044	79044	79044	79044	79044
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	7416	7416	7416	7416	7416	7416	7416	7416	7416	7416	79044	79044	79044	79044	79044	79044	79044	79044	79044	79044
3	511	Ridgelands Road	towards Rockhampton	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 5c: Assign Development SAR4s onto the SCR Network (Total)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	towards Rockhampton	-	11335	11335	11335	11335	11335	11335	11335	11335	11335	11335	122205	122205	122205	122205	122205	122205	122205	122205	122205	122205
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	11335	11335	11335	11335	11335	11335	11335	11335	11335	11335	122205	122205	122205	122205	122205	122205	122205	122205	122205	122205
3	511	Ridgelands Road	towards Rockhampton	-	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 6: Identify Road Links with >5% Development SAR4 Impacts (Total)

					Towards the Site - Development Generated SAR% (Year by Year)										Away from the Site - Development Generated SAR% (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	-	9.11%	8.93%	8.84%	8.75%	8.66%	8.58%	8.49%	8.41%	8.33%	8.24%	98.17%	96.24%	95.28%	94.34%	93.41%	92.48%	91.57%	90.66%	89.76%	88.87%
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	7.27%	7.13%	7.06%	6.99%	6.92%	6.85%	6.78%	6.72%	6.65%	6.58%	78.39%	76.85%	76.09%	75.33%	74.59%	73.85%	73.12%	72.39%	71.68%	70.97%
3	511	Ridgelands Road	towards Rockhampton	-	2.19%	2.15%	2.13%	2.11%	2.09%	2.07%	2.05%	2.03%	2.00%	1.99%	24.15%	23.67%	23.44%	23.20%	22.97%	22.75%	22.52%	22.30%	22.08%	21.86%
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.16%	0.16%	0.16%	0.16%	0.16%	0.15%	0.15%	0.15%	0.15%	0.15%	1.80%	1.77%	1.75%	1.73%	1.72%	1.70%	1.68%	1.67%	1.65%	1.63%
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.15%	0.15%	0.15%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	1.65%	1.62%	1.61%	1.59%	1.57%	1.56%	1.54%	1.53%	1.51%	1.50%
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.12%	0.12%	0.12%	0.12%	1.45%	1.43%	1.41%	1.40%	1.38%	1.37%	1.36%	1.34%	1.33%	1.32%
7	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	1.29%	1.26%	1.25%	1.24%	1.22%	1.21%	1.20%	1.19%	1.18%	1.17%
8	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.12%	0.12%	0.12%	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	1.34%	1.32%	1.30%	1.29%	1.28%	1.26%	1.25%	1.24%	1.23%	1.22%
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Step 7a: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the General Market)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3																	
4																	
5																	
6																	
7																	

Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage -way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	250000	7503	5.8	43160	12007
4																	
5																	
6																	
7																	

Contribution per year ($) **24977**

Step 7b: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the RRR Project)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	450000	14286	5.5	79044	6031
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	450000	14286	5.5	79044	5845
3																	
4																	
5																	
6																	
7																	

Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage -way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	450000	14286	5.5	79044	6031
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	450000	14286	5.5	79044	5845
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	450000	14286	5.5	79044	21990
4																	
5																	
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Contribution per year ($) **45743**

250000tpa of material delivered to the General Marterial + 450000tpa of material delivered to the RRR Project (Stage 1)

Step 7c: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%)(Total)

Contribution per year ($) (for material to the General Market) =	24977
Contribution per year ($) (for material to the RRR Project) =	45743
Contribution per year ($) (Total) =	70720

Average Production Rate (Year 1 to Year 10) (tpa):	700000
Contribution (cents / tonne)	10.10
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Pavement Impact Assessment

The methodology of the pavement impact assessment is based on Department of Transport and Main Roads' Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment December 2018.

Step 1a: Project Parameters and Impact Potential Assessment Area (Material delivered to the General Market)

Total Production Rate (tpa):	800,000
Material (tpa) delivered to the General Market:	250,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	4%	0.5	0.9	0.020	0.143
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	32%	8.5	6.8	0.163	1.578
10	B-double	40.0	0.53	6.3	0.42	7.09	32%	12.8	6.8	0.170	2.016
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	32%	11.5	6.8	0.170	2.016
Total	-	-	-	-	-	-	100%	33.3	21.4	0.52	5.75

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

Contribution (cents / tonne):	10.11
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 1b: Project Parameters and Impact Potential Assessment Area (Material delivered to the RRR Project)

Total Production Rate (tpa):	800,000
Material (tpa) delivered to the RRR Project:	550,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	550,000	550,000	550,000	550,000	550,000	550,000	550,000	550,000	550,000	550,000	5,500,000

Class	**Type**	**Payload**	**Unloaded SAR4**	**Loaded SAR4**	**Unloaded SAR5**	**Loaded SAR5**	**HV %**	**Weighted Average Payload**	**No Trip per day (In / Out)**	**Weighted Average Unloaded SAR4**	**Weighted Average loaded SAR4**
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0.0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	3.0%	0.4	1.5	0.015	0.107
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0.0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0.0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0.0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0.0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	50.0%	13.3	24.9	0.255	2.465
10	B-double	40.0	0.53	6.3	0.42	7.09	23.5%	9.4	11.7	0.125	1.481
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0.0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0.0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	23.5%	8.5	11.7	0.125	1.481
Total	-	-	-	-	-	-	100%	31.5	49.7	0.52	5.53

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 2: Road Asset Data from DTMR

							ARMIS TRAFFIC DATA				
						Sealed		2020			
Sect. No.	Road No.	Road Name	Road Sections	Ch	Ch	Length (km)	AADT 2020	HV %	Growth Adopt	AADT HV	SAR4 per HV
1	511	Ridgelands Road	towards Rockhampton	4.8	4.1	0.7	1557	13.69	1.0%	213.2	3.2
2	511	Ridgelands Road	towards Rockhampton (Point 6)	4.1	2.6	1.5	2892	9.23	1.0%	266.9	3.2
3	511	Ridgelands Road	towards Rockhampton	2.6	0.0	2.6	4022	7.61	1.0%	306.1	3.2
4	10E	Bruce Highway	to the Carpricorn Highway (south	0.0	1.4	1.4	14183	15.93	1.0%	2259.4	2.9
5	10E	Bruce Highway	to the Carpricorn Highway (south	1.4	4.3	2.9	19695	12.51	1.0%	2463.8	2.9
6	10E	Bruce Highway	to the Carpricorn Highway (south	4.3	5.5	1.2	19223	14.59	1.0%	2804.6	2.9
7	10F	Bruce Highway	to Rockhampton (north)	0.0	1.6	1.6	30049	10.54	1.0%	3167.2	2.9
8	10F	Bruce Highway	to Rockhampton (north)	1.6	4.3	2.7	22919	13.25	1.0%	3036.8	2.9
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Step 3: Calculate Background SAR4s

Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment states:

> The raw road asset data from TMR provides a two-way AADT with a heavy vehicle percentage for each identified road segment. Unfortunately, it is not feasible to calculate background SAR5s and SAR12s as the raw data does not capture loaded and unloaded heavy vehicle movements. As such, the scoping assessment is based on SAR4s (ESAs). This is a reasonable approach noting that 82% of the TMR network is sealed roads with granular pavement (SAR4 / ESA).

									Background SAR4s (Each Direction) Year by Year without Development										
Sect. No.	**Road No.**	**Road Name**	**Ch**	**Ch**	**2020 AADT per Dir.**	**2020 HV%**	**2020 HV per Dir.**	**SAR4 per HV**	**AADT year 2020**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	4.8	4.1	778.5	13.69	107	3.2	124482	126984	128253	129536	130831	132140	133461	134796	136144	137505	138880
2	511	Ridgelands Road	4.1	2.6	1446.0	9.23	133	3.2	155888	159021	160612	162218	163840	165478	167133	168804	170492	172197	173919
3	511	Ridgelands Road	2.6	0.0	2011.0	7.61	153	3.2	178747	182340	184164	186005	187865	189744	191641	193558	195493	197448	199423
4	10E	Bruce Highway	0.0	1.4	7091.5	15.93	1130	2.9	1195762	1219797	1231995	1244315	1256758	1269325	1282019	1294839	1307787	1320865	1334074
5	10E	Bruce Highway	1.4	4.3	9847.5	12.51	1232	2.9	1303990	1330200	1343502	1356937	1370506	1384211	1398053	1412034	1426154	1440416	1454820
6	10E	Bruce Highway	4.3	5.5	9611.5	14.59	1402	2.9	1484353	1514189	1529331	1544624	1560070	1575671	1591428	1607342	1623416	1639650	1656046
7	10F	Bruce Highway	0.0	1.6	15024.5	10.54	1584	2.9	1676222	1709914	1727013	1744283	1761726	1779343	1797137	1815108	1833259	1851592	1870108
8	10F	Bruce Highway	1.6	4.3	11459.5	13.25	1518	2.9	1607209	1639514	1655909	1672468	1689193	1706085	1723146	1740377	1757781	1775359	1793112
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250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the General Market)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	0.9	0.5	0	150	0.9	3.57	3	1071
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	6.8	0.51	3	1224	6.8	4.93	34	11837
10	B-double	6.8	0.53	4	1273	6.8	6.3	43	15126
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	6.8	0.53	4	1273	6.8	6.3	43	15126
Total	-	-	-	11	3920	-	-	123	43160

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the RRR Project)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	1.5	0.5	1	262	1.5	3.57	5	1870
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	24.9	0.51	13	4452	24.9	4.93	123	43040
10	B-double	11.7	0.53	6	2175	11.7	6.3	74	25850
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	11.7	0.53	6	2175	11.7	6.3	74	25850
Total	-	-	-	26	9064	-	-	275	96610

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 5a: Assign Development SAR4s onto the SCR Network (Material delivered to the General Market)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
3	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 5b: Assign Development SAR4s onto the SCR Network (Material delivered to the RRR Project)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	100%	9064	9064	9064	9064	9064	9064	9064	9064	9064	9064	96610	96610	96610	96610	96610	96610	96610	96610	96610	96610
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	9064	9064	9064	9064	9064	9064	9064	9064	9064	9064	96610	96610	96610	96610	96610	96610	96610	96610	96610	96610
3	511	Ridgelands Road	towards Rockhampton	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 5c: Assign Development SAR4s onto the SCR Network (Total)

					Towards the Site - Development Generated SAR (Year by Year)										**Away from the Site - Development Generated SAR (Year by Year)**									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	towards Rockhampton	-	12983	12983	12983	12983	12983	12983	12983	12983	12983	12983	139770	139770	139770	139770	139770	139770	139770	139770	139770	139770
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	12983	12983	12983	12983	12983	12983	12983	12983	12983	12983	139770	139770	139770	139770	139770	139770	139770	139770	139770	139770
3	511	Ridgelands Road	towards Rockhampton	-	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 6: Identify Road Links with >5% Development SAR4 Impacts (Total)

					Towards the Site - Development Generated SAR% (Year by Year)										Away from the Site - Development Generated SAR% (Year by Year)									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	towards Rockhampton	-	10.43%	10.22%	10.12%	10.02%	9.92%	9.83%	9.73%	9.63%	9.54%	9.44%	######	######	######	######	######	######	######	######	######	######
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	8.33%	8.16%	8.08%	8.00%	7.92%	7.85%	7.77%	7.69%	7.62%	7.54%	89.66%	87.89%	87.02%	86.16%	85.31%	84.46%	83.63%	82.80%	81.98%	81.17%
3	511	Ridgelands Road	towards Rockhampton	-	2.19%	2.15%	2.13%	2.11%	2.09%	2.07%	2.05%	2.03%	2.00%	1.99%	24.15%	23.67%	23.44%	23.20%	22.97%	22.75%	22.52%	22.30%	22.08%	21.86%
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.16%	0.16%	0.16%	0.16%	0.16%	0.15%	0.15%	0.15%	0.15%	0.15%	1.80%	1.77%	1.75%	1.73%	1.72%	1.70%	1.68%	1.67%	1.65%	1.63%
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.15%	0.15%	0.15%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	1.65%	1.62%	1.61%	1.59%	1.57%	1.56%	1.54%	1.53%	1.51%	1.50%
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.12%	0.12%	0.12%	0.12%	1.45%	1.43%	1.41%	1.40%	1.38%	1.37%	1.36%	1.34%	1.33%	1.32%
7	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	1.29%	1.26%	1.25%	1.24%	1.22%	1.21%	1.20%	1.19%	1.18%	1.17%
8	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.12%	0.12%	0.12%	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	1.34%	1.32%	1.30%	1.29%	1.28%	1.26%	1.25%	1.24%	1.23%	1.22%
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250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 7a: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the General Market)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
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4																	
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Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage-way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	250000	7503	5.8	43160	12007
4																	
5																	
6																	
7																	

Contribution per year ($)	24977

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 7b: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the RRR Project)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	550000	17460	5.5	96610	7371
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	550000	17460	5.5	96610	7144
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Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage-way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	550000	17460	5.5	96610	7371
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	550000	17460	5.5	96610	7144
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	550000	17460	5.5	96610	26877
4																	
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Contribution per year ($) **55908**

250000tpa of material delivered to the General Marterial + 550000tpa of material delivered to the RRR Project (Stage 1)

Step 7c: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%)(Total)

Contribution per year ($) (for material to the General Market) =	24977
Contribution per year ($) (for material to the RRR Project) =	55908
Contribution per year ($) (Total) =	80885

Average Production Rate (Year 1 to Year 10) (tpa):	800000
Contribution (cents / tonne)	10.11
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Pavement Impact Assessment

The methodology of the pavement impact assessment is based on Department of Transport and Main Roads' Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment December 2018.

Step 1a: Project Parameters and Impact Potential Assessment Area (Material delivered to the General Market)

Total Production Rate (tpa):	900,000
Material (tpa) delivered to the General Market:	250,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	4%	0.5	0.9	0.020	0.143
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	32%	8.5	6.8	0.163	1.578
10	B-double	40.0	0.53	6.3	0.42	7.09	32%	12.8	6.8	0.170	2.016
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	32%	11.5	6.8	0.170	2.016
Total	-	-	-	-	-	-	100%	33.3	21.4	0.52	5.75

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

Contribution (cents / tonne):	10.12
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 1b: Project Parameters and Impact Potential Assessment Area (Material delivered to the RRR Project)

Total Production Rate (tpa):	900,000
Material (tpa) delivered to the RRR Project:	650,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	6,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0.0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	3.0%	0.4	1.8	0.015	0.107
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0.0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0.0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0.0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0.0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	50.0%	13.3	29.4	0.255	2.465
10	B-double	40.0	0.53	6.3	0.42	7.09	23.5%	9.4	13.8	0.125	1.481
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0.0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0.0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	23.5%	8.5	13.8	0.125	1.481
Total	-	-	-	-	-	-	100%	31.5	58.8	0.52	5.53

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 2: Road Asset Data from DTMR

							ARMIS TRAFFIC DATA				
						Sealed		2020			
Sect. No.	Road No.	Road Name	Road Sections	Ch	Ch	Length (km)	AADT 2020	HV %	Growth Adopt	AADT HV	SAR4 per HV
1	511	Ridgelands Road	towards Rockhampton	4.8	4.1	0.7	1557	13.69	1.0%	213.2	3.2
2	511	Ridgelands Road	towards Rockhampton (Point 6)	4.1	2.6	1.5	2892	9.23	1.0%	266.9	3.2
3	511	Ridgelands Road	towards Rockhampton	2.6	0.0	2.6	4022	7.61	1.0%	306.1	3.2
4	10E	Bruce Highway	to the Carpricorn Highway (south	0.0	1.4	1.4	14183	15.93	1.0%	2259.4	2.9
5	10E	Bruce Highway	to the Carpricorn Highway (south	1.4	4.3	2.9	19695	12.51	1.0%	2463.8	2.9
6	10E	Bruce Highway	to the Carpricorn Highway (south	4.3	5.5	1.2	19223	14.59	1.0%	2804.6	2.9
7	10F	Bruce Highway	to Rockhampton (north)	0.0	1.6	1.6	30049	10.54	1.0%	3167.2	2.9
8	10F	Bruce Highway	to Rockhampton (north)	1.6	4.3	2.7	22919	13.25	1.0%	3036.8	2.9
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Step 3: Calculate Background SAR4s

Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment states:

> The raw road asset data from TMR provides a two-way AADT with a heavy vehicle percentage for each identified road segment. Unfortunately, it is not feasible to calculate background SAR5s and SAR12s as the raw data does not capture loaded and unloaded heavy vehicle movements. As such, the scoping assessment is based on SAR4s (ESAs). This is a reasonable approach noting that 82% of the TMR network is sealed roads with granular pavement (SAR4 / ESA).

									Background SAR4s (Each Direction) Year by Year without Development										
Sect. No.	**Road No.**	**Road Name**	**Ch**	**Ch**	**2020 AADT per Dir.**	**2020 HV%**	**2020 HV per Dir.**	**SAR4 per HV**	**AADT year 2020**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	4.8	4.1	778.5	13.69	107	3.2	124482	126984	128253	129536	130831	132140	133461	134796	136144	137505	138880
2	511	Ridgelands Road	4.1	2.6	1446.0	9.23	133	3.2	155888	159021	160612	162218	163840	165478	167133	168804	170492	172197	173919
3	511	Ridgelands Road	2.6	0.0	2011.0	7.61	153	3.2	178747	182340	184164	186005	187865	189744	191641	193558	195493	197448	199423
4	10E	Bruce Highway	0.0	1.4	7091.5	15.93	1130	2.9	1195762	1219797	1231995	1244315	1256758	1269325	1282019	1294839	1307787	1320865	1334074
5	10E	Bruce Highway	1.4	4.3	9847.5	12.51	1232	2.9	1303990	1330200	1343502	1356937	1370506	1384211	1398053	1412034	1426154	1440416	1454820
6	10E	Bruce Highway	4.3	5.5	9611.5	14.59	1402	2.9	1484353	1514189	1529331	1544624	1560070	1575671	1591428	1607342	1623416	1639650	1656046
7	10F	Bruce Highway	0.0	1.6	15024.5	10.54	1584	2.9	1676222	1709914	1727013	1744283	1761726	1779343	1797137	1815108	1833259	1851592	1870108
8	10F	Bruce Highway	1.6	4.3	11459.5	13.25	1518	2.9	1607209	1639514	1655909	1672468	1689193	1706085	1723146	1740377	1757781	1775359	1793112
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250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the General Market)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	0.9	0.5	0	150	0.9	3.57	3	1071
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	6.8	0.51	3	1224	6.8	4.93	34	11837
10	B-double	6.8	0.53	4	1273	6.8	6.3	43	15126
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	6.8	0.53	4	1273	6.8	6.3	43	15126
Total	-	-	-	11	3920	-	-	123	43160

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the RRR Project)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	1.8	0.5	1	310	1.8	3.57	6	2210
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	29.4	0.51	15	5262	29.4	4.93	145	50865
10	B-double	13.8	0.53	7	2570	13.8	6.3	87	30550
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	13.8	0.53	7	2570	13.8	6.3	87	30550
Total	-	-	-	31	10712	-	-	325	114175

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 5a: Assign Development SAR4s onto the SCR Network (Material delivered to the General Market)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
3	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 5b: Assign Development SAR4s onto the SCR Network (Material delivered to the RRR Project)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	towards Rockhampton	100%	10712	10712	10712	10712	10712	10712	10712	10712	10712	10712	114175	114175	114175	114175	114175	114175	114175	114175	114175	114175
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	10712	10712	10712	10712	10712	10712	10712	10712	10712	10712	114175	114175	114175	114175	114175	114175	114175	114175	114175	114175
3	511	Ridgelands Road	towards Rockhampton	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 5c: Assign Development SAR4s onto the SCR Network (Total)

Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
					1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	-	14631	14631	14631	14631	14631	14631	14631	14631	14631	14631	157335	157335	157335	157335	157335	157335	157335	157335	157335	157335
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	14631	14631	14631	14631	14631	14631	14631	14631	14631	14631	157335	157335	157335	157335	157335	157335	157335	157335	157335	157335
3	511	Ridgelands Road	towards Rockhampton	-	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 6: Identify Road Links with >5% Development SAR4 Impacts (Total)

Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	Towards the Site - Development Generated SAR% (Year by Year)										Away from the Site - Development Generated SAR% (Year by Year)									
					1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	-	11.75%	11.52%	11.41%	11.30%	11.18%	11.07%	10.96%	10.85%	10.75%	10.64%	######	######	######	######	######	######	######	######	######	######
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	9.39%	9.20%	9.11%	9.02%	8.93%	8.84%	8.75%	8.67%	8.58%	8.50%	######	98.94%	97.96%	96.99%	96.03%	95.08%	94.14%	93.21%	92.28%	91.37%
3	511	Ridgelands Road	towards Rockhampton	-	2.19%	2.15%	2.13%	2.11%	2.09%	2.07%	2.05%	2.03%	2.00%	1.99%	24.15%	23.67%	23.44%	23.20%	22.97%	22.75%	22.52%	22.30%	22.08%	21.86%
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.16%	0.16%	0.16%	0.16%	0.16%	0.15%	0.15%	0.15%	0.15%	0.15%	1.80%	1.77%	1.75%	1.73%	1.72%	1.70%	1.68%	1.67%	1.65%	1.63%
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.15%	0.15%	0.15%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	1.65%	1.62%	1.61%	1.59%	1.57%	1.56%	1.54%	1.53%	1.51%	1.50%
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.12%	0.12%	0.12%	0.12%	1.45%	1.43%	1.41%	1.40%	1.38%	1.37%	1.36%	1.34%	1.33%	1.32%
7	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	1.29%	1.26%	1.25%	1.24%	1.22%	1.21%	1.20%	1.19%	1.18%	1.17%
8	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.12%	0.12%	0.12%	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	1.34%	1.32%	1.30%	1.29%	1.28%	1.26%	1.25%	1.24%	1.23%	1.22%
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Step 7a: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the General Market)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10) Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	Development Contribution per year (Year 1 to Year 10) ($)
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3																	
4																	
5																	
6																	
7																	

Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage -way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10) Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	Development Contribution per year (Year 1 to Year 10) ($)
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	250000	7503	5.8	43160	12007
4																	
5																	
6																	
7																	

Contribution per year ($)	24977

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 7b: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the RRR Project)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	650000	20635	5.5	114175	8712
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	650000	20635	5.5	114175	8443
3																	
4																	
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Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage -way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	650000	20635	5.5	114175	8712
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	650000	20635	5.5	114175	8443
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	650000	20635	5.5	114175	31764
4																	
5																	
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7																	

Contribution per year ($) **66073**

250000tpa of material delivered to the General Marterial + 650000tpa of material delivered to the RRR Project (Stage 1)

Step 7c: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%)(Total)

Contribution per year ($) (for material to the General Market) =	24977
Contribution per year ($) (for material to the RRR Project) =	66073
Contribution per year ($) (Total) =	91050

Average Production Rate (Year 1 to Year 10) (tpa):	900000
Contribution (cents / tonne)	10.12
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Pavement Impact Assessment

The methodology of the pavement impact assessment is based on Department of Transport and Main Roads' Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment December 2018.

Step 1a: Project Parameters and Impact Potential Assessment Area (Material delivered to the General Market)

Total Production Rate (tpa):	1,000,000
Material (tpa) delivered to the General Market:	250,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	4%	0.5	0.9	0.020	0.143
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	32%	8.5	6.8	0.163	1.578
10	B-double	40.0	0.53	6.3	0.42	7.09	32%	12.8	6.8	0.170	2.016
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	32%	11.5	6.8	0.170	2.016
Total	-	-	-	-	-	-	100%	33.3	21.4	0.52	5.75

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

Contribution (cents / tonne):	10.12
Contribution ($ / tonne)	0.101

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 1b: Project Parameters and Impact Potential Assessment Area (Material delivered to the RRR Project)

Total Production Rate (tpa):	1,000,000
Material (tpa) delivered to the RRR Project:	750,000
First Operational Year:	2022
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	7,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0.0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	3.0%	0.4	2.0	0.015	0.107
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0.0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0.0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0.0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0.0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	50.0%	13.3	33.9	0.255	2.465
10	B-double	40.0	0.53	6.3	0.42	7.09	23.5%	9.4	15.9	0.125	1.481
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0.0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0.0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	23.5%	8.5	15.9	0.125	1.481
Total	-	-	-	-	-	-	100%	31.5	67.8	0.52	5.53

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 2: Road Asset Data from DTMR

							ARMIS TRAFFIC DATA				
						Sealed		2020			
Sect. No.	Road No.	Road Name	Road Sections	Ch	Ch	Length (km)	AADT 2020	HV %	Growth Adopt	AADT HV	SAR4 per HV
1	511	Ridgelands Road	towards Rockhampton	4.8	4.1	0.7	1557	13.69	1.0%	213.2	3.2
2	511	Ridgelands Road	towards Rockhampton (Point 6)	4.1	2.6	1.5	2892	9.23	1.0%	266.9	3.2
3	511	Ridgelands Road	towards Rockhampton	2.6	0.0	2.6	4022	7.61	1.0%	306.1	3.2
4	10E	Bruce Highway	to the Carpricorn Highway (south	0.0	1.4	1.4	14183	15.93	1.0%	2259.4	2.9
5	10E	Bruce Highway	to the Carpricorn Highway (south	1.4	4.3	2.9	19695	12.51	1.0%	2463.8	2.9
6	10E	Bruce Highway	to the Carpricorn Highway (south	4.3	5.5	1.2	19223	14.59	1.0%	2804.6	2.9
7	10F	Bruce Highway	to Rockhampton (north)	0.0	1.6	1.6	30049	10.54	1.0%	3167.2	2.9
8	10F	Bruce Highway	to Rockhampton (north)	1.6	4.3	2.7	22919	13.25	1.0%	3036.8	2.9
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Step 3: Calculate Background SAR4s

Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment states:

> The raw road asset data from TMR provides a two-way AADT with a heavy vehicle percentage for each identified road segment. Unfortunately, it is not feasible to calculate background SAR5s and SAR12s as the raw data does not capture loaded and unloaded heavy vehicle movements. As such, the scoping assessment is based on SAR4s (ESAs). This is a reasonable approach noting that 82% of the TMR network is sealed roads with granular pavement (SAR4 / ESA).

									Background SAR4s (Each Direction) Year by Year without Development										
Sect. No.	**Road No.**	**Road Name**	**Ch**	**Ch**	**2020 AADT per Dir.**	**2020 HV%**	**2020 HV per Dir.**	**SAR4 per HV**	**AADT year 2020**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	4.8	4.1	778.5	13.69	107	3.2	124482	126984	128253	129536	130831	132140	133461	134796	136144	137505	138880
2	511	Ridgelands Road	4.1	2.6	1446.0	9.23	133	3.2	155888	159021	160612	162218	163840	165478	167133	168804	170492	172197	173919
3	511	Ridgelands Road	2.6	0.0	2011.0	7.61	153	3.2	178747	182340	184164	186005	187865	189744	191641	193558	195493	197448	199423
4	10E	Bruce Highway	0.0	1.4	7091.5	15.93	1130	2.9	1195762	1219797	1231995	1244315	1256758	1269325	1282019	1294839	1307787	1320865	1334074
5	10E	Bruce Highway	1.4	4.3	9847.5	12.51	1232	2.9	1303990	1330200	1343502	1356937	1370506	1384211	1398053	1412034	1426154	1440416	1454820
6	10E	Bruce Highway	4.3	5.5	9611.5	14.59	1402	2.9	1484353	1514189	1529331	1544624	1560070	1575671	1591428	1607342	1623416	1639650	1656046
7	10F	Bruce Highway	0.0	1.6	15024.5	10.54	1584	2.9	1676222	1709914	1727013	1744283	1761726	1779343	1797137	1815108	1833259	1851592	1870108
8	10F	Bruce Highway	1.6	4.3	11459.5	13.25	1518	2.9	1607209	1639514	1655909	1672468	1689193	1706085	1723146	1740377	1757781	1775359	1793112
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250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the General Market)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	0.9	0.5	0	150	0.9	3.57	3	1071
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	6.8	0.51	3	1224	6.8	4.93	34	11837
10	B-double	6.8	0.53	4	1273	6.8	6.3	43	15126
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	6.8	0.53	4	1273	6.8	6.3	43	15126
Total	-	-	-	11	3920	-	-	123	43160

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 4a: Calculate Development SAR4s (Material delivered to the RRR Project)

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	2.0	0.5	1	357	2.0	3.57	7	2550
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	33.9	0.51	17	6071	33.9	4.93	167	58690
10	B-double	15.9	0.53	8	2965	15.9	6.3	100	35250
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	15.9	0.53	8	2965	15.9	6.3	100	35250
Total	-	-	-	35	12360	-	-	375	131740

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 5a: Assign Development SAR4s onto the SCR Network (Material delivered to the General Market)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
3	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 5b: Assign Development SAR4s onto the SCR Network (Material delivered to the RRR Project)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	towards Rockhampton	100%	12360	12360	12360	12360	12360	12360	12360	12360	12360	12360	131740	131740	131740	131740	131740	131740	131740	131740	131740	131740
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	12360	12360	12360	12360	12360	12360	12360	12360	12360	12360	131740	131740	131740	131740	131740	131740	131740	131740	131740	131740
3	511	Ridgelands Road	towards Rockhampton	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	10E	Bruce Highway	to the Carpricorn Highway (south)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	10F	Bruce Highway	to Rockhampton (north)	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 5c: Assign Development SAR4s onto the SCR Network (Total)

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**	**1 2022**	**2 2023**	**3 2024**	**4 2025**	**5 2026**	**6 2027**	**7 2028**	**8 2029**	**9 2030**	**10 2031**
1	511	Ridgelands Road	towards Rockhampton	-	16279	16279	16279	16279	16279	16279	16279	16279	16279	16279	174901	174901	174901	174901	174901	174901	174901	174901	174901	174901
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	16279	16279	16279	16279	16279	16279	16279	16279	16279	16279	174901	174901	174901	174901	174901	174901	174901	174901	174901	174901
3	511	Ridgelands Road	towards Rockhampton	-	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	-	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 6: Identify Road Links with >5% Development SAR4 Impacts (Total)

					Towards the Site - Development Generated SAR% (Year by Year)										Away from the Site - Development Generated SAR% (Year by Year)									
Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031
1	511	Ridgelands Road	towards Rockhampton	-	13.08%	12.82%	12.69%	12.57%	12.44%	12.32%	12.20%	12.08%	11.96%	11.84%	######	######	######	######	######	######	######	######	######	######
2	511	Ridgelands Road	towards Rockhampton (Point 6)	-	10.44%	10.24%	10.14%	10.04%	9.94%	9.84%	9.74%	9.64%	9.55%	9.45%	######	######	######	######	######	######	######	######	######	######
3	511	Ridgelands Road	towards Rockhampton	-	2.19%	2.15%	2.13%	2.11%	2.09%	2.07%	2.05%	2.03%	2.00%	1.99%	24.15%	23.67%	23.44%	23.20%	22.97%	22.75%	22.52%	22.30%	22.08%	21.86%
4	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.16%	0.16%	0.16%	0.16%	0.16%	0.15%	0.15%	0.15%	0.15%	0.15%	1.80%	1.77%	1.75%	1.73%	1.72%	1.70%	1.68%	1.67%	1.65%	1.63%
5	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.15%	0.15%	0.15%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	1.65%	1.62%	1.61%	1.59%	1.57%	1.56%	1.54%	1.53%	1.51%	1.50%
6	10E	Bruce Highway	to the Carpricorn Highway (south)	-	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.12%	0.12%	0.12%	0.12%	1.45%	1.43%	1.41%	1.40%	1.38%	1.37%	1.36%	1.34%	1.33%	1.32%
7	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	1.29%	1.26%	1.25%	1.24%	1.22%	1.21%	1.20%	1.19%	1.18%	1.17%
8	10F	Bruce Highway	to Rockhampton (north)	-	0.12%	0.12%	0.12%	0.12%	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	1.34%	1.32%	1.30%	1.29%	1.28%	1.26%	1.25%	1.24%	1.23%	1.22%
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Step 7a: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the General Market)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10): Average Production Rate for years > 5% increase in SAR	Fleet data: Average trips per year	Fleet data: Loaded SAR per Trip	Fleet data: SAR per year	Development Contribution per year (Year 1 to Year 10) ($)
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
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4																	
5																	
6																	
7																	

Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage-way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10): Average Production Rate for years > 5% increase in SAR	Fleet data: Average trips per year	Fleet data: Loaded SAR per Trip	Fleet data: SAR per year	Development Contribution per year (Year 1 to Year 10) ($)
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	250000	7503	5.8	43160	12007
4																	
5																	
6																	
7																	

Contribution per year ($): **24977**

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 7b: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%) (Material delivered to the RRR Project)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	750000	23810	5.5	131740	10052
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	750000	23810	5.5	131740	9742
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4																	
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Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage -way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	750000	23810	5.5	131740	10052
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	750000	23810	5.5	131740	9742
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	750000	23810	5.5	131740	36650
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5																	
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7																	

Contribution per year ($)	76238

250000tpa of material delivered to the General Marterial + 750000tpa of material delivered to the RRR Project (Stage 1)

Step 7c: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%)(Total)

Contribution per year ($) (for material to the General Market) =	24977
Contribution per year ($) (for material to the RRR Project) =	76238
Contribution per year ($) (Total) =	101215

Average Production Rate (Year 1 to Year 10) (tpa):	1000000
Contribution (cents / tonne)	10.12
Contribution ($ / tonne)	0.101

150000tpa of material delivered to the General Marterial (Stage 2)

Pavement Impact Assessment

The methodology of the pavement impact assessment is based on Department of Transport and Main Roads' Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment December 2018.

Step 1: Project Parameters and Impact Potential Assessment Area

Additional Production Rate (tpa):	150,000
First Operational Year:	2025
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	1,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	4%	0.5	0.5	0.020	0.143
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	32%	8.5	4.1	0.163	1.578
10	B-double	40.0	0.53	6.3	0.42	7.09	32%	12.8	4.1	0.170	2.016
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	32%	11.5	4.1	0.170	2.016
Total	-	-	-	-	-	-	100%	33.3	12.8	0.52	5.75

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

Contribution (cents / tonne):	7.40
Contribution ($ / tonne)	0.074

150000tpa of material delivered to the General Marterial (Stage 2)

Step 2: Road Asset Data from DTMR

Sect. No.	Road No.	Road Name	Road Sections	Ch	Ch	Sealed Length (km)	ARMIS TRAFFIC DATA AADT 2020	2020 HV %	Growth Adopt	AADT HV	SAR4 per HV
1	511	Ridgelands Road	towards Rockhampton	4.8	4.1	0.7	1557	13.69	1.0%	213.2	3.2
2	511	Ridgelands Road	towards Rockhampton (Point 6)	4.1	2.6	1.5	2892	9.23	1.0%	266.9	3.2
3	511	Ridgelands Road	towards Rockhampton	2.6	0.0	2.6	4022	7.61	1.0%	306.1	3.2
4	10E	Bruce Highway	to the Carpricorn Highway (south	0.0	1.4	1.4	14183	15.93	1.0%	2259.4	2.9
5	10E	Bruce Highway	to the Carpricorn Highway (south	1.4	4.3	2.9	19695	12.51	1.0%	2463.8	2.9
6	10E	Bruce Highway	to the Carpricorn Highway (south	4.3	5.5	1.2	19223	14.59	1.0%	2804.6	2.9
7	10F	Bruce Highway	to Rockhampton (north)	0.0	1.6	1.6	30049	10.54	1.0%	3167.2	2.9
8	10F	Bruce Highway	to Rockhampton (north)	1.6	4.3	2.7	22919	13.25	1.0%	3036.8	2.9
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150000tpa of material delivered to the General Marterial (Stage 2)

Step 3: Calculate Background SAR4s

Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment states:

> The raw road asset data from TMR provides a two-way AADT with a heavy vehicle percentage for each identified road segment. Unfortunately, it is not feasible to calculate background SAR5s and SAR12s as the raw data does not capture loaded and unloaded heavy vehicle movements. As such, the scoping assessment is based on SAR4s (ESAs). This is a reasonable approach noting that 82% of the TMR network is sealed roads with granular pavement (SAR4 / ESA).

									Background SAR4s (Each Direction) Year by Year without Development										
Sect. No.	Road No.	Road Name	Ch	Ch	2020 AADT per Dir.	2020 HV%	2020 HV per Dir.	SAR4 per HV	AADT year 2020	1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034
1	511	Ridgelands Road	4.8	4.1	778.5	13.69	107	3.2	124482	130831	132140	133461	134796	136144	137505	138880	140269	141672	143088
2	511	Ridgelands Road	4.1	2.6	1446.0	9.23	133	3.2	155888	163840	165478	167133	168804	170492	172197	173919	175659	177415	179189
3	511	Ridgelands Road	2.6	0.0	2011.0	7.61	153	3.2	178747	187865	189744	191641	193558	195493	197448	199423	201417	203431	205465
4	10E	Bruce Highway	0.0	1.4	7091.5	15.93	1130	2.9	1195762	1256758	1269325	1282019	1294839	1307787	1320865	1334074	1347415	1360889	1374498
5	10E	Bruce Highway	1.4	4.3	9847.5	12.51	1232	2.9	1303990	1370506	1384211	1398053	1412034	1426154	1440416	1454820	1469368	1484062	1498903
6	10E	Bruce Highway	4.3	5.5	9611.5	14.59	1402	2.9	1484353	1560070	1575671	1591428	1607342	1623416	1639650	1656046	1672607	1689333	1706226
7	10F	Bruce Highway	0.0	1.6	15024.5	10.54	1584	2.9	1676222	1761726	1779343	1797137	1815108	1833259	1851592	1870108	1888809	1907697	1926774
8	10F	Bruce Highway	1.6	4.3	11459.5	13.25	1518	2.9	1607209	1689193	1706085	1723146	1740377	1757781	1775359	1793112	1811044	1829154	1847446
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150000tpa of material delivered to the General Marterial (Stage 2)

Step 4: Calculate Development SAR4s

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	0.5	0.5	0	90	0.5	3.57	2	643
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	4.1	0.51	2	735	4.1	4.93	20	7102
10	B-double	4.1	0.53	2	764	4.1	6.3	26	9076
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	4.1	0.53	2	764	4.1	6.3	26	9076
Total	-	-	-	7	2352	-	-	74	25896

150000tpa of material delivered to the General Marterial (Stage 2)

Step 5: Assign Development SAR4s onto the SCR Network

					Towards the Site - Development Generated SAR (Year by Year)										Away from the Site - Development Generated SAR (Year by Year)									
Sect. No.	**Road No.**	**Road Name**	**Road Section**	**Dev. Trip %**	**1 2025**	**2 2026**	**3 2027**	**4 2028**	**5 2029**	**6 2030**	**7 2031**	**8 2032**	**9 2033**	**10 2034**	**1 2025**	**2 2026**	**3 2027**	**4 2028**	**5 2029**	**6 2030**	**7 2031**	**8 2032**	**9 2033**	**10 2034**
1	511	Ridgelands Road	towards Rockhampton	100%	2352	2352	2352	2352	2352	2352	2352	2352	2352	2352	25896	25896	25896	25896	25896	25896	25896	25896	25896	25896
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	2352	2352	2352	2352	2352	2352	2352	2352	2352	2352	25896	25896	25896	25896	25896	25896	25896	25896	25896	25896
3	511	Ridgelands Road	towards Rockhampton	100%	2352	2352	2352	2352	2352	2352	2352	2352	2352	2352	25896	25896	25896	25896	25896	25896	25896	25896	25896	25896
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1176	1176	1176	1176	1176	1176	1176	1176	1176	1176	12948	12948	12948	12948	12948	12948	12948	12948	12948	12948
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1176	1176	1176	1176	1176	1176	1176	1176	1176	1176	12948	12948	12948	12948	12948	12948	12948	12948	12948	12948
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1176	1176	1176	1176	1176	1176	1176	1176	1176	1176	12948	12948	12948	12948	12948	12948	12948	12948	12948	12948
7	10F	Bruce Highway	to Rockhampton (north)	50%	1176	1176	1176	1176	1176	1176	1176	1176	1176	1176	12948	12948	12948	12948	12948	12948	12948	12948	12948	12948
8	10F	Bruce Highway	to Rockhampton (north)	50%	1176	1176	1176	1176	1176	1176	1176	1176	1176	1176	12948	12948	12948	12948	12948	12948	12948	12948	12948	12948
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150000tpa of material delivered to the General Marterial (Stage 2)

Step 6: Identify Road Links with >5% Development SAR4 Impacts

Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	Towards the Site - Development Generated SAR% (Year by Year)										Away from the Site - Development Generated SAR% (Year by Year)									
					1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034	1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034
1	511	Ridgelands Road	towards Rockhampton	100%	1.89%	1.80%	1.78%	1.76%	1.74%	1.73%	1.71%	1.69%	1.68%	1.66%	20.80%	19.79%	19.60%	19.40%	19.21%	19.02%	18.83%	18.65%	18.46%	18.28%
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	1.51%	1.44%	1.42%	1.41%	1.39%	1.38%	1.37%	1.35%	1.34%	1.33%	16.61%	15.81%	15.65%	15.49%	15.34%	15.19%	15.04%	14.89%	14.74%	14.60%
3	511	Ridgelands Road	towards Rockhampton	100%	1.32%	1.25%	1.24%	1.23%	1.22%	1.20%	1.19%	1.18%	1.17%	1.16%	14.49%	13.78%	13.65%	13.51%	13.38%	13.25%	13.12%	12.99%	12.86%	12.73%
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	0.10%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	1.08%	1.03%	1.02%	1.01%	1.00%	0.99%	0.98%	0.97%	0.96%	0.95%
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	0.09%	0.09%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.99%	0.94%	0.94%	0.93%	0.92%	0.91%	0.90%	0.89%	0.88%	0.87%
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	0.08%	0.08%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.87%	0.83%	0.82%	0.81%	0.81%	0.80%	0.79%	0.78%	0.77%	0.77%
7	10F	Bruce Highway	to Rockhampton (north)	50%	0.07%	0.07%	0.07%	0.07%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.77%	0.73%	0.73%	0.72%	0.71%	0.71%	0.70%	0.69%	0.69%	0.68%
8	10F	Bruce Highway	to Rockhampton (north)	50%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.06%	0.06%	0.81%	0.77%	0.76%	0.75%	0.74%	0.74%	0.73%	0.72%	0.71%	0.71%
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150000tpa of material delivered to the General Marterial (Stage 2)

Step 7: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1																	
2																	
3																	
4																	
5																	

Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage -way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10)				Development Contribution per year (Year 1 to Year 10) ($)
													Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	150000	4502	5.8	25896	1976
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	150000	4502	5.8	25896	1915
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	150000	4502	5.8	25896	7204
4																	
5																	
6																	
7																	

Average Production Rate (Year 1 to Year 10) (tpa):	150000
Contribution (cents / tonne)	7.40
Contribution ($ / tonne)	0.074

Contribution per year ($)	11095

250000tpa of material delivered to the General Marterial (Stage 2)

Pavement Impact Assessment

The methodology of the pavement impact assessment is based on Department of Transport and Main Roads' Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment December 2018.

Step 1: Project Parameters and Impact Potential Assessment Area

Additional Production Rate (tpa):	250,000
First Operational Year:	2025
Assessment Year (No of Years):	10
Days of operation per year:	351

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
% of "Base" Annual Tonnage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	Total
Annual Tonnage	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000

Class	Type	Payload	Unloaded SAR4	Loaded SAR4	Unloaded SAR5	Loaded SAR5	HV %	Weighted Average Payload	No Trip per day (In / Out)	Weighted Average Unloaded SAR4	Weighted Average loaded SAR4
3	Two axle truck	6.5	0.54	2.98	0.43	3.29	0%	0.0	0.0	0.000	0.000
4	Three axle truck	13.0	0.5	3.57	0.41	4.14	4%	0.5	0.9	0.020	0.143
5	Four axle truck	15.0	0.46	4.09	0.37	4.89	0%	0.0	0.0	0.000	0.000
6	Three axle articulated	11.5	0.6	4.43	0.46	4.88	0%	0.0	0.0	0.000	0.000
7	Four axle articulated	18.0	0.56	5.02	0.44	5.73	0%	0.0	0.0	0.000	0.000
8	Five axle articulated	24.5	0.52	5.61	0.41	6.58	0%	0.0	0.0	0.000	0.000
9	Six axle articulated (semi trailer)	26.5	0.51	4.93	0.41	5.61	32%	8.5	6.8	0.163	1.578
10	B-double	40.0	0.53	6.3	0.42	7.09	32%	12.8	6.8	0.170	2.016
11	Double road train (Road train 1)	51.5	0.55	8.34	0.43	9.53	0%	0.0	0.0	0.000	0.000
12	Triple road train	76.5	0.58	11.75	0.44	13.45	0%	0.0	0.0	0.000	0.000
'10' *	Truck and Dog	36.0	0.53	6.3	0.42	7.09	32%	11.5	6.8	0.170	2.016
Total	-	-	-	-	-	-	100%	33.3	21.4	0.52	5.75

* According to Austroads Vehicle Classification System (duplicated as last page of this assessment), Truck and Dog is classified as Class 10.

Contribution (cents / tonne):	7.40
Contribution ($ / tonne)	0.074

250000tpa of material delivered to the General Marterial (Stage 2)

Step 2: Road Asset Data from DTMR

Sect. No.	Road No.	Road Name	Road Sections	Ch	Ch	Sealed Length (km)	ARMIS TRAFFIC DATA AADT 2020	2020 HV %	Growth Adopt	AADT HV	SAR4 per HV
1	511	Ridgelands Road	towards Rockhampton	4.8	4.1	0.7	1557	13.69	1.0%	213.2	3.2
2	511	Ridgelands Road	towards Rockhampton (Point 6)	4.1	2.6	1.5	2892	9.23	1.0%	266.9	3.2
3	511	Ridgelands Road	towards Rockhampton	2.6	0.0	2.6	4022	7.61	1.0%	306.1	3.2
4	10E	Bruce Highway	to the Carpricorn Highway (south	0.0	1.4	1.4	14183	15.93	1.0%	2259.4	2.9
5	10E	Bruce Highway	to the Carpricorn Highway (south	1.4	4.3	2.9	19695	12.51	1.0%	2463.8	2.9
6	10E	Bruce Highway	to the Carpricorn Highway (south	4.3	5.5	1.2	19223	14.59	1.0%	2804.6	2.9
7	10F	Bruce Highway	to Rockhampton (north)	0.0	1.6	1.6	30049	10.54	1.0%	3167.2	2.9
8	10F	Bruce Highway	to Rockhampton (north)	1.6	4.3	2.7	22919	13.25	1.0%	3036.8	2.9
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250000tpa of material delivered to the General Marterial (Stage 2)

Step 3: Calculate Background SAR4s

Guide to Traffic Impact Assessment Practice Note: Pavement Impact Assessment states:

> The raw road asset data from TMR provides a two-way AADT with a heavy vehicle percentage for each identified road segment. Unfortunately, it is not feasible to calculate background SAR5s and SAR12s as the raw data does not capture loaded and unloaded heavy vehicle movements. As such, the scoping assessment is based on SAR4s (ESAs). This is a reasonable approach noting that 82% of the TMR network is sealed roads with granular pavement (SAR4 / ESA).

									Background SAR4s (Each Direction) Year by Year without Development										
Sect. No.	**Road No.**	**Road Name**	**Ch**	**Ch**	**2020 AADT per Dir.**	**2020 HV%**	**2020 HV per Dir.**	**SAR4 per HV**	**AADT year 2020**	**1 2025**	**2 2026**	**3 2027**	**4 2028**	**5 2029**	**6 2030**	**7 2031**	**8 2032**	**9 2033**	**10 2034**
1	511	Ridgelands Road	4.8	4.1	778.5	13.69	107	3.2	124482	130831	132140	133461	134796	136144	137505	138880	140269	141672	143088
2	511	Ridgelands Road	4.1	2.6	1446.0	9.23	133	3.2	155888	163840	165478	167133	168804	170492	172197	173919	175659	177415	179189
3	511	Ridgelands Road	2.6	0.0	2011.0	7.61	153	3.2	178747	187865	189744	191641	193558	195493	197448	199423	201417	203431	205465
4	10E	Bruce Highway	0.0	1.4	7091.5	15.93	1130	2.9	1195762	1256758	1269325	1282019	1294839	1307787	1320865	1334074	1347415	1360889	1374498
5	10E	Bruce Highway	1.4	4.3	9847.5	12.51	1232	2.9	1303990	1370506	1384211	1398053	1412034	1426154	1440416	1454820	1469368	1484062	1498903
6	10E	Bruce Highway	4.3	5.5	9611.5	14.59	1402	2.9	1484353	1560070	1575671	1591428	1607342	1623416	1639650	1656046	1672607	1689333	1706226
7	10F	Bruce Highway	0.0	1.6	15024.5	10.54	1584	2.9	1676222	1761726	1779343	1797137	1815108	1833259	1851592	1870108	1888809	1907697	1926774
8	10F	Bruce Highway	1.6	4.3	11459.5	13.25	1518	2.9	1607209	1689193	1706085	1723146	1740377	1757781	1775359	1793112	1811044	1829154	1847446
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250000tpa of material delivered to the General Marterial (Stage 2)

Step 4: Calculate Development SAR4s

Class	Type	Unloaded (Towards the Site)				Loaded (Away from the Site)			
		Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year	Daily Volumes	SAR4 per veh	SAR4 per day	SAR4 per year
3	Two axle truck	0.0	0.54	0	0	0.0	2.98	0	0
4	Three axle truck (tadem truck)	0.9	0.5	0	150	0.9	3.57	3	1071
5	Four axle truck	0.0	0.46	0	0	0.0	4.09	0	0
6	Three axle articulated	0.0	0.6	0	0	0.0	4.43	0	0
7	Four axle articulated	0.0	0.56	0	0	0.0	5.02	0	0
8	Five axle articulated	0.0	0.52	0	0	0.0	5.61	0	0
9	Six axle articulated (semi trailer)	6.8	0.51	3	1224	6.8	4.93	34	11837
10	B-double	6.8	0.53	4	1273	6.8	6.3	43	15126
11	Double road train (Road train 1)	0.0	0.55	0	0	0.0	8.34	0	0
12	Triple road train	0.0	0.58	0	0	0.0	11.75	0	0
'10'	Truck and Dog	6.8	0.53	4	1273	6.8	6.3	43	15126
Total	-	-	-	11	3920	-	-	123	43160

<u>250000tpa of material delivered to the General Marterial (Stage 2)</u>

Step 5: Assign Development SAR4s onto the SCR Network

Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	Towards the Site - Development Generated SAR (Year by Year) 1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034	Away from the Site - Development Generated SAR (Year by Year) 1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034
1	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
3	511	Ridgelands Road	towards Rockhampton	100%	3920	3920	3920	3920	3920	3920	3920	3920	3920	3920	43160	43160	43160	43160	43160	43160	43160	43160	43160	43160
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
7	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
8	10F	Bruce Highway	to Rockhampton (north)	50%	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	21580	21580	21580	21580	21580	21580	21580	21580	21580	21580
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Step 6: Identify Road Links with >5% Development SAR4 Impacts

Sect. No.	Road No.	Road Name	Road Section	Dev. Trip %	Towards the Site - Development Generated SAR% (Year by Year)										Away from the Site - Development Generated SAR% (Year by Year)									
					1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034	1 2025	2 2026	3 2027	4 2028	5 2029	6 2030	7 2031	8 2032	9 2033	10 2034
1	511	Ridgelands Road	towards Rockhampton	100%	3.15%	3.00%	2.97%	2.94%	2.91%	2.88%	2.85%	2.82%	2.79%	2.77%	34.67%	32.99%	32.66%	32.34%	32.02%	31.70%	31.39%	31.08%	30.77%	30.47%
2	511	Ridgelands Road	towards Rockhampton (Point 6)	100%	2.51%	2.39%	2.37%	2.35%	2.32%	2.30%	2.28%	2.25%	2.23%	2.21%	27.69%	26.34%	26.08%	25.82%	25.57%	25.32%	25.06%	24.82%	24.57%	24.33%
3	511	Ridgelands Road	towards Rockhampton	100%	2.19%	2.09%	2.07%	2.05%	2.03%	2.00%	1.99%	1.97%	1.95%	1.93%	24.15%	22.97%	22.75%	22.52%	22.30%	22.08%	21.86%	21.64%	21.43%	21.22%
4	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	0.16%	0.16%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%	0.14%	1.80%	1.72%	1.70%	1.68%	1.67%	1.65%	1.63%	1.62%	1.60%	1.59%
5	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	0.15%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.13%	0.13%	0.13%	1.65%	1.57%	1.56%	1.54%	1.53%	1.51%	1.50%	1.48%	1.47%	1.45%
6	10E	Bruce Highway	to the Carpricorn Highway (south)	50%	0.13%	0.13%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	1.45%	1.38%	1.37%	1.36%	1.34%	1.33%	1.32%	1.30%	1.29%	1.28%
7	10F	Bruce Highway	to Rockhampton (north)	50%	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.10%	0.10%	0.10%	1.29%	1.22%	1.21%	1.20%	1.19%	1.18%	1.17%	1.15%	1.14%	1.13%
8	10F	Bruce Highway	to Rockhampton (north)	50%	0.12%	0.12%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	1.34%	1.28%	1.26%	1.25%	1.24%	1.23%	1.22%	1.20%	1.19%	1.18%
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Step 7: Calculate Contribution to Offset Development Impacts (for Road Sections that Development SAR % > 5%)

Towards the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage way Code	Ch	Ch	Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10) Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	Development Contribution per year (Year 1 to Year 10) ($)
1																	
2																	
3																	
4																	
5																	

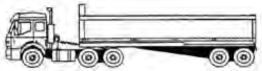
Away from the Quarry

Sect. No	Road No	Road Name	Road Section	Carriage-way Code	Ch	Ch	Sealed Length	Marginal Cost (cents/ SAR-km)	Dev. Trip %	No of Year (>5% increase in SAR)	Pavement Type	Load Damage Exponent	Fleet data (Year 1 to Year 10) Average Production Rate for years > 5% increase in SAR	Average trips per year	Loaded SAR per Trip	SAR per year	Development Contribution per year (Year 1 to Year 10) ($)
1	511	Ridgelands Road	towards Rockhampton	1 / 2 / 3	4.8	4.1	0.7	10.9	100%	10	GN	4	250000	7503	5.8	43160	3293
2	511	Ridgelands Road	towards Rockhampton (Point 6)	1	4.1	2.6	1.45	5.1	100%	10	GN	4	250000	7503	5.8	43160	3192
3	511	Ridgelands Road	towards Rockhampton	1	2.6	0.0	2.6	10.7	100%	10	GN/AC	4 / 5	250000	7503	5.8	43160	12007
4																	
5																	
6																	
7																	

Average Production Rate (Year 1 to Year 10) (tpa):	250000
Contribution (cents / tonne)	7.40
Contribution ($ / tonne)	0.074

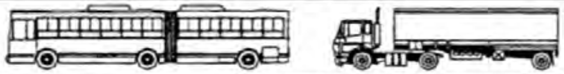
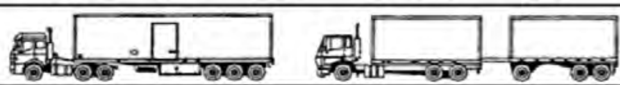
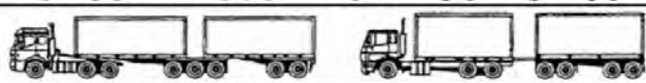
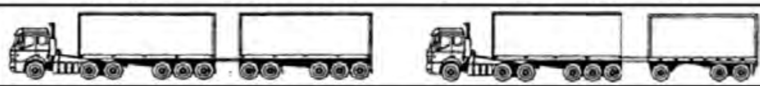
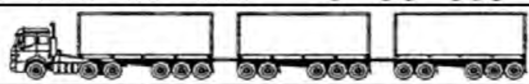
Contribution per year ($): 18492

SAR by Austroads HV class

Class	Typical description	Dominant vehicle in each class
Medium (5.5m to 14.5m)		
3	Two axle truck	
4	Three axle truck	
5	Four axle truck	
Long (11.5m to 19.0m)		
6	Three axle articulated	
7	Four axle articulated	
8	Five axle articulated	
9	Six axle articulated (semi-trailer)	
Medium combination (17.5m to 36.5m)		
10	B Double	
11	Double road train	
Large combination (over 33.0m)		
12	Triple road train	

Austroads vehicle class	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Legal Loading (t)	15	22.5	27.5	24	31.5	39	42.5	62.5	79	115.5
Base Load per SAR4	13.6	19.2	23	21.8	27.4	33	37.7	56.2	70	102.3
Unloaded Axle Group Load (t)	8.5	9.5	12.5	12.5	13.5	14.5	16	22.5	27.5	39
Unloaded SAR4	0.54	0.5	0.46	0.6	0.56	0.52	0.51	0.53	0.55	0.58
Unloaded SAR5	0.43	0.41	0.37	0.46	0.44	0.41	0.41	0.42	0.43	0.44
Unloaded SAR12	0.11	0.11	0.09	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Loaded Axle Group Load (t)	15	22.5	27.5	24	31.5	39	42.5	62.5	79	115.5
Loaded SAR4	2.98	3.57	4.09	4.43	5.02	5.61	4.93	6.3	8.34	11.75
Loaded SAR5	3.29	4.14	4.89	4.88	5.73	6.58	5.61	7.09	9.53	13.45
Loaded SAR12	6.6	12.08	17.07	9.65	15.13	20.61	14.63	17.17	25.71	36.79
Payload (t)	6.5	13	15	11.5	18	24.5	26.5	40	51.5	76.5

AUSTROADS Vehicle Classification System

Level 1	Level 2		Level 3			
Length (indicative)	Axles and Axle Groups		Vehicle Type	AUSTROADS Classification		
Type	Axles	Groups	Typical Description	Class	Parameters	Typical Configuration
			LIGHT VEHICLES			
Short up to 5.5m		1 or 2	**Short** Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc	**1**	d(1) ≤ 3.2m and axles = 2	
Medium 5.5m to 14.5m	3, 4 or 5	3	**Short - Towing** Trailer, Caravan, Boat, etc	**2**	groups = 3 d(1) ≥ 2.1m, d(1) ≤ 3.2m, d(2) ≥ 2.1m and axles = 3, 4 or 5	
			HEAVY VEHICLES			
	2	2	**Two Axle Truck or Bus**	**3**	d(1) > 3.2m and axles = 2	
	3	2	**Three Axle Truck or Bus**	**4**	axles = 3 and groups = 2	
	> 3	2	**Four Axle Truck**	**5**	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	**Three Axle Articulated** Three axle articulated vehicle, or Rigid vehicle and trailer	**6**	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	**Four Axle Articulated** Four axle articulated vehicle, or Rigid vehicle and trailer	**7**	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	**Five Axle Articulated** Five axle articulated vehicle, or Rigid vehicle and trailer	**8**	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	≥ 6	> 2	**Six Axle Articulated** Six axle articulated vehicle, or Rigid vehicle and trailer	**9**	axles = 6 and groups > 2 or axles > 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	**B Double** B Double, or Heavy truck and trailer	**10**	groups = 4 and axles > 6	
	> 6	5 or 6	**Double Road Train** Double road train, or Medium articulated vehicle and one dog trailer (M.A.D.)	**11**	groups = 5 or 6 and axles > 6	
Large Combination Over 33.0m	> 6	> 6	**Triple Road Train** Triple road train, or Heavy truck and three trailers	**12**	groups > 6 and axles > 6	

Definitions:
Group: Axle group, where adjacent axles are less than 2.1m apart
Groups: Number of axle groups
Axles: Number of axles (maximum axle spacing of 10.0m)

d(1): Distance between first and second axle
d(2): Distance between second and third axle

Appendix F

Council Information Request and SARA Information Request

Rockhampton Office
232 Bolsover St, Rockhampton
Gracemere Office
1 Ranger St, Gracemere
Mount Morgan Office
32 Hall St, Mount Morgan

12 January 2022

Our reference: D/589-2013
Enquiries to: Aidan Murray
Telephone: 07 4936 8099

Nine Mile Sands Pty Ltd T/A Rockhampton Sands
C/- Groundwork Plus
PO BOX 1779
MILTON QLD 4064

Dear Sir/Madam

AMENDED INFORMATION REQUEST – DEVELOPMENT APPLICATION D/589-2013 FOR 'OTHER CHANGE' TO A MATERIAL CHANGE OF USE FOR EXTRACTIVE INDUSTRY (EXTENSION) – SITUATED AT LOT 250 FOGARTY ROAD, FAIRY BOWER – DESCRIBED AS LOT 250 ON R2621

Council refers to your application received by Council on 01 December 2021.

Council officers have undertaken a detailed assessment of the development application and require you to provide further information to address the following issues:

1.0 Traffic Impact Assessment (TIA)

1.1 Traffic Impact Assessment (TIA) has not addressed the worst case scenario for haulage between the extractive industry site and the Rockhampton Ring Road (RRR) project including but not limited to Nine Mile Road, Glenmore Road, Hollingsworth Street and Alexandra Street etc. Further information is required which identifies and addresses all local government roads potentially impacted by the proposed development and operations.

In accordance with the State Assessment Referral Agency (SARA) pre-lodgement advice dated 21 July 2021 and Rockhampton Regional Council (RRC) pre-lodgement meeting minutes dated 30 June 2021, it is advised to use the worst case scenario of haulage routes between the extractive industry site and access to the RRR construction sites. This may include haulage involving the use of a number of Local Government roads in the South and North Rockhampton areas. Please amend the TIA to include all possible haulage routes (including council roads) that can be used to transport material from the extractive industry site to RRR construction sites.

Please provide details regarding traffic generation from the proposed development and any impact to the current traffic volumes on possible haulage routes (including council roads) from the extractive industry site to RRR construction sites.

Please also provide 'Delay' summarised information in the Sidra analysis for uncontrolled intersections (Stop/give way intersections) to see if the development traffic exceeds 5% of the base traffic for any movements in the design peak periods and if any mitigation measures are required.

The traffic volume comparison must be carried out in accordance with the Guide to Traffic Impact Assessment (GTIA) requirements and the TIA must be carried out and signed by a Registered Professional Engineer of Queensland (RPEQ).

Note: please refer to DTMR (SARA) and RRC pre-lodgement minutes and TIA must be carried out accordingly.

2.0 Pavement Impact Assessment (PIA)

2.1 Pavement Impact Assessment (PIA) has not addressed the impact on any local roads for the proposed scenarios. Further information is required addressing impacts on all relevant local government roads, for an increased output of 250,000 tons per annum (tpa) and an additional increased output of 750,000 tpa specifically for the RRR project.

Please provide a Pavement Impact Assessment (PIA) that addresses two different scenarios, one that addresses the permanent increase in extraction material volume to 250,000 tonnes per annum and one that addresses the temporary increase in extraction during the RRR construction (i.e. 1 million tonnes per annum). All possible haulage routes (including Council roads in North and South Rockhampton areas) must be included into the RRR project scenario. Two different road maintenance levies for local government roads will need to be calculated and the PIA must be carried out and signed by a Registered Professional Engineer of Queensland (RPEQ).

Note: please refer to the DTMR (SARA) and RRC pre-lodgement minutes and the PIA must be carried out accordingly. Under the current MCU approval condition 4.4, a road maintenance levy of $0.22 per tonne with CPI increase has been placed.

3.0 Hours of Operation

3.1 Please clarify proposed hours of operation. Parts of the application material state the extractive industry will operate 6:00am to 6:00pm Monday to Saturday and 6:00am to 3:00pm on Sundays (excluding public holidays). This represents a change to the current operation of the extractive industry as condition 10.3 of the current decision notice issued 9 June 2016 limits the extractive industry use to “no operations on Sunday or Public Holidays”.

Operation on Sundays conflicts with Acceptable Outcomes AO3.2 and AO3.3 of the Extractive Industry Code in the *Rockhampton Region Planning Scheme 2015* (version 2.2), which states the following:

- **AO3.2** – “Extraction, crushing, screening, loading, operation of plant equipment, ancillary activities and haulage are limited to Monday to Saturday between the hours of 06:00 and 18:00.”
- **AO3.3** – “Operations do not occur on Sunday or public holidays.”

Council does not support a change to the approved hours of operation conditioned under the 2016 decision notice. It is recommended the application material (including the Environmental Management Plan) be amended remove references to operations on Sundays 6:00am to 3:00pm. The amended documents should be resubmitted to Council as part of a response to this information request.

Under section 13 of the Development Assessment Rules, the Applicant has three (3) options available in response to this information request. The Applicant must give the Assessment Manager:

1. all of the information requested; or
2. part of the information requested, together with a notice requiring the Assessment Manager and each referral agency to proceed with the assessment of the application; or
3. a notice:
    i. stating the Applicant does not intend to supply any of the information requested; and
    ii. requiring the Assessment Manager and each referral agency to proceed with the assessment of the application.

Response to this further information request should be forwarded to:

General.Enquiries@rrc.qld.gov.au or;
Development Assessment Section
Rockhampton Regional Council
PO Box 1860
ROCKHAMPTON QLD 4700

A response needs to be received within a period of three (3) months from the date of this letter, In accordance with section 68 (1) of the *Planning Act 2016* and sections 12 and 13 of the Development Assessment Rules. Please forward your response to this information request to Council at your earliest convenience, in order for the assessment of your application to progress further.

Should you have any queries regarding the above information request, please contact the undersigned on 07 4936 8099.

Yours faithfully

Aidan Murray
Planning Officer
Planning and Regulatory Services

Information Request Response Form

(to be returned to the Assessment Manager with the response)

I ________________________________ choose to respond to the Assessment Manager's Information Request:

- ☐ in full;

  OR

- ☐ in part, with this notice requiring the Assessment Manager and each referral agency to proceed with the assessment of the application;

  OR

- ☐ stating that I do not intend to supply any of the information requested; and requiring the Assessment Manager and each referral agency to proceed with the assessment of the application.

A copy of the response to the Assessment Manager's information request has been provided to all Referral Agencies nominated on the Confirmation Notice.

I understand the requirements of this Information Request as listed above.

Signed : __________________________________ Date : __________________

Position : _________________________________

SARA reference: 2112-26672 SRA
Applicant reference: 2493.DA1
Council reference: D/589-2013

27 January 2022

Nine Mile Sands Pty Ltd T/A Rockhampton Sands
C/- Groundwork Plus
PO Box 1779
MILTON QLD 4064
planning@groundwork.com.au

Attention: Sam Lyons

Dear Sir/Madam,

SARA information request - 250 Fogarty Road, Fairy Bower

(Given under section 12 of the Development Assessment Rules)

This notice has been issued because the State Assessment and Referral Agency (SARA) has identified that information necessary to assess your application against the relevant provisions of the State Development Assessment Provisions has not been provided.

State transport infrastructure	
1.	**Issue:** Performance outcome (PO) 6 of State Development Assessment Provisions (SDAP) State code 6 (Protection of State transport networks) requires that development involving the haulage of fill, extracted material or excavated spoil material exceeding 10,000 tonnes per year does not damage the pavement of a state-controlled road. PO6 recommends that a Traffic and Pavement Impact Assessment (TPIA) prepared by a Registered Professional Engineer of Queensland (RPEQ) in accordance with requirements of the Department of Transport and Main Roads' (DTMR) Guide to Traffic Impact Assessment (GTIA). The TPIA was not certified by an RPEQ. **Action:** Provide a TPIA which is certified by the RPEQ responsible for its preparation in accordance with the requirements of the DTMR GTIA.
2.	**Issue:** Section 3 of the TPIA acknowledges TTPlus have been advised that TMR have not confirmed whether a service or access road will be established along the Rockhampton Ring Road (RRR) project corridor for the delivery of material to the site. On this basis, and for the purpose of the TPIA, it should be assumed that all haulage to the RRR project, and

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Rockhampton
PO Box 113, Rockhampton QLD 4700

	to the general market does not occur along the RRR alignment. This matter was specifically discussed with TMR at a pre-lodgement meeting on 8 July 2021 and provided via formal written advice by SARA. **Action:** Amend the TPIA as necessary to ensure that all assessment is carried out on the basis that there is no service or haul road established along or within the RRR alignment and that all material haulage occurs on the existing road network.
4.	**Issue:** PO8 of SDAP State code 6 requires that development involving the haulage of fill, extracted material or excavated spoil material exceeding 10,000 tonnes per year does not damage the pavement of a state-controlled road. A such the TPIA has assumed a 1% per annum (compound) growth rate based on two nearby DTMR traffic count site locations on the Rockhampton – Ridgelands Road (511). However, predicted growth rates for other State-controlled Road networks have not been provided. **Action:** Amend the TPIA to consider material haulage for the RRR to occur via the existing road network and growth rates for other impacted SCR's be considered. The TPIA should also be amended to account for differing growth rates on the road network.
5.	**Issue:** Based on the assumed transport routes the only intersection on the SCR assessed as part of the TPIA is the intersection of the Rockhampton – Ridgelands Road / Nine Mile Road. The GTIA requires the spatial extent of the assessment area to extend to all parts of the road network that are impacted by greater than 5%. **Action:** Amend the TPIA to consider the broader road network and demonstrate that no other SCR intersections are impacted by more than 5% as per the GTIA requirements. If other parts of the SCR network are impacted by more than 5% the TPIA will need to assess these locations and recommend suitable management or mitigation measures to ameliorate these impacts.
6.	**Issue:** Section 6.3 of the TPIA briefly discusses crash statistics but does not adequately address the road safety assessment requirements of the GTIA. Due to assumption that all RRR supply will occur via the RRR alignment, no traffic assessment nor road safety assessment has been carried out beyond the limited assessment of the Rockhampton – Ridgelands Road / Nine Mile Road. **Action:** Amend the TPIA as necessary to ensure that all assessment is carried out on the basis that there is no service of haul road established along or within the RRR alignment and that all material haulage occurs on the existing road network. Additionally, the TPIA must include a full and proper assessment of the potential impacts of the development on road safety in accordance with the requirements of the GTIA.
7.	**Issue:** As there is an existing approval in place for the extraction of up to 100,000 tpa, the TPIA assumes that the traffic associated with the existing operations is already on the road network and has therefore only assessed the trip generation and pavement impacts for the additional 150,000 tpa for the general market supply. This approach is considered

	reasonable from a traffic capacity assessment perspective when investigating the development impacts at SCR intersections, however from a pavement impact assessment perspective TMR does not consider this approach to be appropriate. If the current application is approved, any new approval will effectively supersede any existing approvals and as such, for the purposes assessing the pavement impacts, the entire haulage of up to 1,000,000 tpa (for the RRR supply) and 250,000 tpa (for the general market supply) should be considered. **Action:** Amend the TPIA as necessary to ensure that all assessment is carried out on the basis that there is no service or haul road established along or within the RRR alignment and that all material haulage occurs on the existing road network. Additionally, the TPIA will need to include the assessment of the full 1,000,000 tpa extraction.
8.	**Action:** Provide an electronic copy of the Excel file used to determine the Pavement Contributions on the SCRs.
Environmentally relevant activity	
	Issue: Further information is required to demonstrate compliance with PO1 of SDAP State code 22: Environmentally relevant activities. **Action:** Provide the following information to demonstrate compliance with PO1 of SDAP State code 22: Environmentally relevant activities: 1) confirm that the noise levels provided as part of the supporting information are sufficient to protect and maintain (or improve) the current acoustic quality for the sensitive receptors. 2) confirm that these proposed limits will ensure that these will be able to be achieved during the phase of the activity during where extraction and screening activities will be operating at the maximum rate of operation (i.e. 1,000,000 t per year).
	Issue: Further information is required to demonstrate compliance with PO2 of SDAP State code 22: Environmentally relevant activities. **Action:** Provide the following information to demonstrate compliance with PO2 of SDAP State code 22: Environmentally relevant activities: 1) confirm the proposed limits for emissions where extraction and screening activities will be operating at the maximum rate of operation (i.e. 1,000,000 t per year).
	Issue: The applicant has identified that it will be necessary to discharge waters contaminated by the activity to waters and has proposed limits based on the EPP (Water and Wetland biodiversity) Fitzroy River Subcatchment. This area is located within the Great Barrier Reef Catchment. Recent changes to the *Environmental Protection Regulation 2019* include the addition of s41AA – Release of particular contaminants to Great Barrier Reef catchment waters and other waters that must be considered by the administering authority when making environmental management decisions relating to an activity.

	The administering authority in this instance must refuse to grant an application if the activity will or may have a residual impact and having regard to the matters in the water quality offset policy, the residual impact will not be adequately counterbalanced by offset measures for the relevant activity. It is noted that 41AA(2) does include some exemptions to this requirement. **Action:** To demonstrate compliance with PO4 of SDAP State code 9, provide the following further information: 1) information regarding any significant residual impact that the activity may have. Note: It is recommended that any response reference the guideline, "Reef discharge standards for industrial activities (ESR/2021/5627)". A copy of this guideline is available online: https://environment.des.qld.gov.au/__data/assets/pdf_file/0019/238132/era-gl-reef-discharge-standards-industrial-activities.pdf This guideline also provides a number of additional circumstances where these requirements may not apply. 2) provide further information as to how many times the activity has been inundated previously since it has commenced operation. If this information is not available due to the activity changing owners etc, please provide the number of times inundation has occurred since 2007. 3) provide further information as to how the activity will manage inundation of the site. It is understood that bunding will be installed to prevent inundation in anything other than an 1% AEP event. Please provide the dimensions, location and the construction of the proposed flood bund. It is noted that the provided drawing of the site proposed a buffer of 20m around the majority of the perimeter of the site. Will this provide a sufficient base for a bund of an appropriate height and construction to withstand the forces associated with an 1% AEP flood event and still allow any internal access to the extraction areas or to undertake any works on the bund itself.
	Issue: The application material states that the maximum proposed volume of material extracted and screened per year will be 1,000,000t which is anticipated to reduce to 250,000t following the completion of the Rockhampton Ring Road Project. **Action:** Please provide the estimated duration of time for which it will be necessary for the extraction of material to occur at the increased rate.
	Issue: The Rockhampton Sands Quarry - Site Layout Plan – Drawing Number 2493.DRG.003 includes a number of setout points that define each area. **Action:** Provide the GPS co-ordinates of these setout points and confirm the depth to which extraction of the resource is proposed. Note: These GPS co-ordinates must be provided to at least four decimal places and be determined using the GDA 2020 datum and the map spheroid WGS84.
Wetland protection area	
	Issue:

	The applicant has stated (in response to PO1 of SDAP State code 9) that no development is proposed within a mapped wetland. The wetland located adjacent to and within the southwest corner and the wetland located to the south of Lot 250 are both identified as High Ecological Significance (HES) wetlands.
	
	The area in which the activity is proposed is located within a mapped wetland protection area. The Map of Queensland wetland environmental values are a state-wide statutory map under the 'Environmental Protection (Water and Wetland Biodiversity) Policy 2019'. The map of referable wetlands includes:
	
	• Wetland Protection Areas (WPAs), which comprise:
	    • HES wetlands within the Great Barrier Reef Catchments; and
	    • trigger areas that represent the area of hydrological influence of HES wetlands; and
	• General Ecological Significance (GES) wetlands.
	
	Significant residual impacts on WPAs are required to be offset in accordance with the Queensland Environmental Offsets Framework.
	
	It is noted that there are no groundwater dependant ecosystems (GDEs) currently mapped as being located within or adjacent to the proposed development. The application material was not accompanied by a significant residual impact (SRI) assessment. No justification has been provided as to why a SRI assessment was not provided or what actions have been undertaken to avoid or mitigate any potential impact.
	
	Action:
	Please provide an SRI assessment undertaken in accordance with the most recent version of Queensland Environmental Offset Policy – Significant Residual Impact Guideline. of the potential impact the activity may have on the wetland. This must include the following detail:
	
	1) potential impacts on the adjacent wetland areas.
	2) a description of those measures that demonstrate that impacts from the activity can be either avoided or sufficiently mitigated to such an extent that an SRI is not required.

	Issue: The applicant's response to PO2 of SDAP State code 9 provided indicates that the proposed development will maintain a 200m buffer from the mapped wetlands. This does not appear to be consistent with the 100m buffer identified in the Rockhampton Sands Quarry - Site Layout Plan – Drawing Number 2493.DRG.003. **Action:** Please confirm the correct distance for the buffer and provide further justification as to how the buffer was determined to be appropriate. This must include information that demonstrates that the proposed activity will not result in any changes to groundwater levels or cause any other potentially deleterious impacts to nearby mapped wetlands. It is noted that there are no Terrestrial or Aquatic GDEs currently identified by either State or Federal online resources. However it is also known that the mapping and identification of GDEs is not yet complete. Please confirm if any onsite investigation has been undertaken that eliminates the possibility that unmapped GDEs may be present.

	Issue: The response to PO3 of SDAP State code 9 states that the proposed increase to the annual extraction volume can be facilitated with minimal changes to the current extractive industry operation. The proposed changes involve a significant increase to the currently approved footprint of the extraction area. From the methodology provided it is understood that material will be extracted until groundwater is exposed, after which, extraction will continue below groundwater level using dredging methods. It is not clear if the applicant proposes to extract the entirety of the identified extraction areas, so that a large single void will be formed, or if the extraction will take place in a series of discrete extraction pits. It is also not clear if it is proposed to reinstate the extraction area so that groundwater is no longer exposed or if water filled voids or ponds connected to groundwater will remain. Further information is required regarding the potential impact to groundwaters from this activity. This information must determine the area of the groundwater likely to be impacted and the impact of any change to adjacent HEV wetlands as well as any other registered groundwater bores on adjacent properties. This must be supported by groundwater modelling that demonstrates impacts representative of the maximum impact likely to be caused by the activity. (i.e. be representative of the activity at its maximum proposed intensity and / or when the extraction area is at its greatest extent). **Action:** To demonstrate compliance with PO3 of SDAP State code 9, provide the following information: 1) If the final landform is to include water filled voids that intercept or otherwise access groundwater, provide sufficient supporting information that demonstrates that this will not result in long term impacts to areas identified as being of high environmental value both in and adjacent to the site. 2) provide details of the proposed groundwater monitoring of the activity. This should include limits and trigger levels for standing water levels and any other groundwater characteristics that are determined to be applicable, that will protect the environmental values of those areas identified as being of high environmental value. The trigger levels should also be accompanied by proposed actions designed to identify and prevent any potential impacts to the relevant environmental values.
	Issue: The activity is located within a defined wetland protection area that is also identified as being a RAMSAR wetland. Therefore, any impact that may cause degradation of land quality must be avoided or mitigated. The application material also indicated that Potential Acid Sulfate Soils (PASS) were present onsite. The application material does propose a buffer distance between the extraction area and an area identified as being of HEV. There is not sufficient supporting information which demonstrates that that this will be sufficient to avoid any deleterious impact. It is understood that, given the nature of the activity, that there will be unavoidable land degradation caused to the operational areas of the quarry. The application material does not appear to discuss how the impacts to this area may be avoided, rather than mitigated. The final landform is also of concern as the disturbance of the soil structure and impacts to the flow and availability of groundwater may also result in significant ongoing potential for

	land degradation. **Action:** To demonstrate compliance with PO6 of SDAP State code 9, provide the following further information: 1) demonstrate that the activity will not result in an increase in land degradation, within the site and within the area of impacted groundwater identified. 2) demonstrate how PASS (including screened material), and stormwater runoff or other waters that have been in contact with this material, will be managed at the point of extraction, stockpiling (including any dewatering that may occur) areas and where the material is screened. 3) include a proposed monitoring program that identifies any potential for land degradation to occur both within the site and any reasonably predicted area located outside of the area.
	Issue: The subject site and proposed development is located in proximity to areas mapped as containing Category C and Category R vegetation. It is unclear if the proposed development will impact these vegetation categories. **Action:** To demonstrate compliance with PO7 of SDAP State code 9, provide supporting information to demonstrate that the proposed development will avoid impacts to Category C and Category R vegetation.

Item	Advice
Federal Government Referral	
1.	The proposed expansion of the quarry is located within an area identified as part of the RAMSAR-Fitzroy River Floodplain wetland. The guideline, "Matters of environmental significance – Significant Impact Guidelines 1.1 – *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*" identifies significant impact criteria. It is strongly recommended that the applicant investigate any additional referrals or requirements to undertake an investigation into the significant residual impacts of the activity with regard to the requirements under the EPBC Act. Any such investigation may also impact any SRI or subsequent offset that may be required under Qld Government legislation.

How to respond

You have three months to respond to this request and the due date to SARA is 26 April 2022**.**
You may respond by providing either: (a) all of the information requested; (b) part of the information requested; or (c) a notice that none of the information will be provided. Further guidance on responding to an information request is provided in section 13 of the Development Assessment Rules (DA Rules).

It is recommended that you provide all the information requested above. If you decide not to provide all the information requested, your application will be assessed and decided based on the information provided to date.

You are requested to upload your response and complete the relevant tasks in MyDAS2.

As SARA is a referral agency for this application, a copy of this information request will be provided to the assessment manager in accordance with section 12.4 of the DA Rules.

If you require further information or have any questions about the above, please contact Thomas Gardiner, Principal Planning Officer on (07) 4924 2916 or via email RockhamptonSARA@dsdilgp.qld.gov.au who will be pleased to assist.

Yours sincerely,

Graeme Kenna
Manager (Planning)

cc Rockhampton Regional Council, enquiries@rrc.qld.gov.au

Development details		
Description:	Development permit	Material change of use for extractive industry (up to 1,000,000 tonnes per annum)
SARA role:	referral agency	
SARA trigger:	Schedule 10, part 20, division 4, table 3, item 1 Wetland Protection Area Schedule 10, part 5, division 4, table 2, item 1 Environmentally relevant activities (only if ERA has not been devolved to a local government) Schedule 10, part 9, division 4, subdivision 1, table 1, item 1 Infrastructure - state transport infrastructure	
SARA reference:	2112-26672 SRA	
Assessment criteria:	State Development Assessment Provisions (SDAP): • State code 6: Protection of state transport networks • State code 9: Great Barrier Reef wetland protection areas • State code 22: Environmentally relevant activities	

Department Principal:
Noel Kay
Project Contact:
Margaret Mak

TRAFFIC TRANSPORT plus

ABN: 54 619 700 239

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6 Mayneview Street, Milton Qld 4064
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TTPlus Ref: 10574
Date: 16 September 2022

ROCKHAMPTON REGIONAL COUNCIL
AMENDED PLANS APPROVED
19 April 2023
DATE
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/589-2013
Dated: 9 June 2016

Nine Mile Sands Pty Ltd, trading as Rockhampton Sands Pty Ltd
c-/ Groundwork Plus
Attention: Sam Lyons

Dear Sam,

Re: Rockhampton Sands Quarry
*Responses to **Council's Traffic Matters***

Traffic & Transport Plus (TTPlus) provided a revised Traffic and Pavement Impact Assessment Report (TPIA) dated 5 July 2022 (Ref.1) for a development application for a production increase of the Rockhampton Sands Quarry located at 250 Fogarty Road, Fairy Bower, QLD, properly described as Lot 250 on R2621 (Subject Site).

The Rockhampton Sands Quarry currently enjoys an Environmental Authority that allows for haulage / extraction of up to 100,000 tonnes per annum (tpa). The proposed development application seeks to temporarily increase the annual extraction volume to 1,000,000tpa to supply material to the Department of Transport and Main Roads' (DTMR) Rockhampton Ring Road Project (RRR Project). It is proposed in the development application that once the RRR Project has been completed, the annual production rate being applied for would reduce to 250,000tpa for delivery to the 'General Market' only, which is an additional 150,000tpa above what is currently approved for the quarry (100,000tpa) (**'General Market' scenario**).

TTPlus has been advised that Rockhampton Regional Council (Council) has reviewed the TPIA. During a meeting with Groundwork Plus, Council requested traffic advice addressing the following points for the proposed 'General Market' scenario:

1. Can the increased traffic volumes be accommodated within Nine Mile Road without compromising traffic safety or worsening the existing scenario, particularly with regards to the Lion Creek Bridge; and
2. Provide a pavement impact contribution calculation for Nine Mile Road based on data provided by Council.

Council has provided the following information / comments:

A. Nine Mile Road is not an approved B-Double Route;

B. Council has recently carried out traffic counts at Nine Mile Road, the results of the traffic counts are listed below:

Year	Location	AADT***	% Com	Speed Limit	AM Peak 8am to 9am	PM Peak 4pm to 5pm
Aug 2022	1.0km N of Edwards Road	470vpd*	35.9%	80km/h	37vph**	46vph**

**vpd = vehicles per day*
*** vph = vehicles per hour*
**** AADT = annual average daily traffic*

C. Council advised that, based on that traffic count data and the removal of B-Doubles from the development traffic, the likely peak hour traffic generation associated with the 'General Market' scenario is listed below:

Proposed Additional Extraction	Proposed Peak Hour Traffic	AM Peak traffic increase (%)	PM Peak traffic increase (%)
150,000tpa (General Market)	7.2vph (3.6 × 2 for IN & OUT)	(7.2 ÷ 37) × 100% = 19.46%	(7.2 ÷ 46) × 100% = 15.65%

[1] *"Traffic and Pavement Impact Assessment Report, Rockhampton Sands Quarry", TTPlus, 5 July 2022.*

D. Council has provided roughness data for Nine Mile Road from the intersection with Ridgelands Road being Chainage 0 through to the intersection with Fogarty Road at Chainage 4507.

TTPlus has been requested to prepare additional assessments to address Council's Traffic Matters No.1 and No.2 discussed above. The responses to Council's Traffic Matters are provided in the following sections of this advice.

1. Response to Traffic Matter No.1 (Safety)

Rockhampton Sands Pty Ltd (Rockhampton Sands) confirms that no B-doubles would be utilised to transport the quarried material from the Subject Site. If Council decides to approve this development application, TTPlus recommends including a condition to limit the fleet size.

The Subject Site is located approximately 0.55km south of the Nine Mile Road / Fogarty Road intersection. Nine Mile Road is approximately 4.5km long between Ridgelands Road and Fogarty Road. Figure 1 illustrates the location of the site relative to Fogarty Road, Nine Mile Road and Ridgelands Road.

The Lion Creek Bridge (along Nine Mile Road) crosses Lion Creek, the location of the Lion Creek Bridge is also illustrated on Figure 1.

Figure 1 – Locality Map

Source: Google Earth [annotations and road names added by TTPlus]

Note: The red shaded lines indicate State controlled roads.

It is expected that Nine Mile Road would continue to be fit-for-purpose (from a safety and capacity perspective). Reasons in support of this are listed below:

1. Daily traffic volumes – The August 2022 AADT of Nine Mile Road was 470vpd. The additional daily trip generation (trucks and cars) associated with the 'General Market' scenario would be less than 60vpd (no B-doubles would be utilised to transport the quarried material), therefore the future AADT of Nine Mile Road, with the additional quarried material (150,000tpa) delivered to the 'General Market', would be less than 600vpd.

2. General road width – The road width requirements outlined in Austroads' "*Guide to Road Design Part 3: Geometric Design*" (Ref.2) have been duplicated below:

Table A 2: Minimum EDD widths for two-lane, two-way rural roads (m)

Element	Design AADT			
	150–500	**500–1000**	**1000–3000**	**> 3000**
Traffic lanes(1)	6.2 (2 x 3.1)	6.2–7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Shoulders(2),(3)	0.85 [1.0]	0.85 [1.0]	1.25 [1.5]	1.75 [2.0]
Total carriageway(3)	7.9(4) [8.2]	7.9 [8.2]–8.7 [9.0]	9.5 [10.0]	10.5 [11.0]

The section of Nine Mile Road between Fogarty Road and Ridgelands Road is approximately 4.5km long, with this whole section of Nine Mile Road being sealed. The road width of Nine Mile Road between Fogarty Road and Ridgelands Road is a minimum of 6.6m with additional road verge / shoulder, which generally complies with the road width requirements (for a road with AADT between 500-1,000vpd) stated in Ref.2. It is noted that the road width of the Lion Creek Bridge is approximately 5.7m, which has been discussed in the next point below. A typical carriageway cross section of Nine Mile Road is illustrated on Figure 2.

Figure 2 – Typical Nine Mile Road Carriageway Cross Section
Source: Google Maps Streetview

3. Road width at the Lion Creek Bridge – The road width of the Lion Creek Bridge is approximately 5.7m, which may not be wide enough for two trucks or a truck & a car to travel in opposite directions.

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[2] *"Guide to Road Design Part 3: Geometric Design", Austroads, 2021.*

Imageries available on Google Maps Streetview of the Lion Creek Bridge are illustrated on Figures 3 to 6. The aerial imagery of the Lion Creek Bridge is illustrated on Figure 7.

Figure 3 – Nine Mile Road, looking north towards Lion Creek Bridge from ~100m south of the Lion Creek Bridge
Source: Google Maps Streeview

Figure 4 – Nine Mile Road, looking north towards Lion Creek Bridge from ~20m south of the Lion Creek Bridge
Source: Google Maps Streeview

Figure 5 – Nine Mile Road, looking south towards Lion Creek Bridge from ~100m north of the Lion Creek Bridge
Source: Google Maps Streeview

Figure 6 – Nine Mile Road, looking south towards Lion Creek Bridge from ~20m north of the Lion Creek Bridge

Source: Google Maps Streeview

Figure 7 – Aerial Imagery of the Lion Creek Bridge

Source: Nearmap [annotations and road names added by TTPlus]

TTPlus recommends installing the following signage to enhance the safety of the road users:

3a. Install 'narrow bridge' (W4-1) sign and 'next 200m' (R9-6) at 200m south and 200 north of the Lion Creek Bridge. The 'narrow bridge' (W4-1) sign and 'next 200m' (R9-6) are illustrated below.

 W4-1	 R9-6
'narrow bridge' (W4-1) sign	'next 200m' (R9-6)

3b. Install an advisory sign stating "Trucks stop here to give-way to opposite traffic" at 15m south of the Lion Creek Bridge. The proposed stopping position of a truck is illustrated on Figure 7.

4. Crash data – The Queensland Government database (https://www.data.qld.gov.au/dataset/crash–data–from–queensland–roads) provides recorded road crash data that can be used to understand what, if any, crash history exists near the Subject Site. The routinely adopted crash frequency and time window metric when issues may be considered to be significant is 3 casualty crashes in the last 5 years.

From review of the crash data from 2016 to the end of 2020 (ie. the most recent 5 years of available data), there has been one reported crash (minor injury) on Nine Mile Road between Ridgelands Road and Fogarty Road. Whilst crashes can be somewhat arbitrary, it is considered that there are no systematic safety issues on Nine Mile Road between Ridgelands Road and Fogarty Road.

With the recommended additional signage near the Lion Creek Bridge, Nine Mile Road (including the Lion Creek Bridge) is anticipated to continue to operate safely and efficiently with the additional traffic associated with the 'General Market' scenario.

2. Response to Traffic Matter No.2 (Pavement Contribution)

Council has provided roughness data for Nine Mile Road from the intersection with Ridgelands Road being Chainage 0 through to the intersection with Fogarty Road at Chainage 4507.

Council does not have a specific methodology to calculate the pavement contribution for pavement impacts on Council roads associated with the additional material (150,000tpa) delivered to the 'General Market'. TTPlus has investigated the utilisation of DTMR's Pavement Impact Assessment (PIA) spreadsheet methodology, which was developed based on DTMR's "*Guidelines for Assessment of Road Impact of Development*" (Ref.3) to determine pavement contribution on Nine Mile Road that may be considered appropriate by Council for the pavement impacts associated with the 'General Market' scenario. It is noted that the pavement impact assessment methodology included in DTMR's updated guideline "*Guide to Traffic Impact Assessment*" (Ref.4) has not been utilised in this instance. The reason is that Ref.4 calculates the pavement contribution based on marginal cost (independent of roughness data), whereas Ref. 3 calculates the pavement contribution based on roughness data.

The following assessment parameters have been adopted in this pavement contribution assessment.

- Additional production to the 'General Market': 150,000tpa;
- First assessment year: 2022;
- Development duration: >10 years;
- Fleet mix: 13.0t payload truck (6%), 26.5t payload semi-trailer (34%) and 36.0t payload truck and dog (60%);
- AADT data: 470vpd (provided by Council);
- Heavy Vehicle (HV) %: 35.9% (provided by Council);
- AADT growth rate: 1% p.a.;
- Pavement roughness: various (average roughness of the road sections provided by Council);
- Seal width: various (measured from Nearmap);
- Maintenance cost and rehabilitation cost: unit costs as per the values indicated in DTMR's PIA spreadsheet (2016 DTMR's base cost);
- ESA per HV value: 3.2 (default value included in DTMR's PIA spreadsheet);
- Terminal roughness: 120NRM (default value included in DTMR's PIA spreadsheet); and
- Inflation rate / discount rate: 7% / 6% (default rates included in DTMR's PIA spreadsheet).

It is noted that the roughness data provided by Council is in terms of International Roughness Index (IRI). The roughness data has been converted to NAASRA Roughness Meter Counts (NRM) by the following formula:

$$NRM = [(IRI \times 26.49) - 1.27]$$

[3] *"Guidelines for Assessment of Road Impact of Development", DTMR, 2006.*
[4] *"Guide to Traffic Impact Assessment", DTMR, 2018.*

All of the applicable project operational parameters have been input into DTMR's PIA spreadsheet. The findings are illustrated in Attachment A Pavement Contribution Assessment and an electronic version of the analysis is also provided.

The results of the pavement contribution assessment as determined by DTMR's PIA spreadsheet method, calculate that the pavement contribution for pavement impacts on Nine Mile Road associated with the 'General Market' scenario is 42.2 cents/tonne (after the annual production exceeds 100,000tpa).

The pavement contribution calculated by DTMR's PIA spreadsheet method is considered to be very high for a 4.5km long road. Based on the roughness data provided by Council, the existing pavement roughness condition (average roughness of 146NRM), is higher than the typical design terminal roughness (assumed roughness at failure) of 120NRM; rehabilitation works are typically recommended to be provided even without the proposed production increase of the quarry.

Council should reasonably consider a significant discount to the pavement contribution calculated by DTMR's PIA spreadsheet method for the reasons listed below:

- the existing pavement roughness is higher than the typical design terminal roughness even without the proposed production increase, and
- the rehabilitation costs indicated in DTMR's PIA spreadsheet are costs for State-controlled roads. The rehabilitation costs for State-controlled roads are usually higher than Council roads, as the sub-base and pavement requirements for State-controlled roads (higher design loadings) are usually higher.

We trust that this information is of assistance. If you require any additional assistance in relation to this matter, please do not hesitate to contact the undersigned.

Yours faithfully

Noel Kay – RPEQ #26424
Traffic & Transport Plus

Attachment A

Pavement Contribution Assessment

Developer Contribution Summary

Sect No.	Road No.	Road Name	Road Sections	Lgth (km)	Reduced Pvt Life		Dev. Contribution (@ the PV Base Yr.) Rehab ($)		Mtce ($)		Total ($)
					To	From	To	From	To	From	
1	1	Nine Mile Road	0-0.5km (from Ridgelands Road)	0.5	1.2%	14.1%		$56,275		$8,962	$65,237
2	1	Nine Mile Road	0.5-1.0km (from Ridgelands Road)	0.5	1.3%	14.8%		$77,739		$8,962	$86,701
3	1	Nine Mile Road	1.0-1.5km (from Ridgelands Road)	0.5	1.2%	13.6%		$43,665		$8,962	$52,627
4	1	Nine Mile Road	1.5-2.0km (from Ridgelands Road)	0.5	1.2%	14.2%		$60,309		$8,962	$69,271
5	1	Nine Mile Road	2.0-2.5km (from Ridgelands Road)	0.5	1.3%	14.9%		$75,985		$8,408	$84,393
6	1	Nine Mile Road	2.5-.30km (from Ridgelands Road)	0.5	1.3%	15.5%		$102,597		$8,408	$111,004
7	1	Nine Mile Road	3.0-3.5km (from Ridgelands Road)	0.5	1.2%	14.7%		$70,901		$8,408	$79,308
8	1	Nine Mile Road	3.5-4.0km (from Ridgelands Road)	0.5	1.1%	13.1%		$30,052		$8,731	$38,783
9	1	Nine Mile Road	4.0-4.5km (from Ridgelands Road)	0.5	1.1%	13.5%		$36,981		$8,731	$45,712
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29											
30											
			Totals [1] =	4.5			$0	$554,503	$0	$78,534	**$633,037**

Start of Development Traffic = 2022

Development Duration 20 years

ESA Increase Trigger = 5.0%

Total Tonnage = 1,500,000 tonnes

Developer Contribution expressed as a Cost per Tonne (@ the PV Base Yr.)

cents / tonne = 42.20

cents / tonne / km = 9.38

Protection Passord for all worksheets = mrd

[1] Includes only road sections that are subject to Development Generated Traffic > 5%

MRD INPUT COSTS

BITUMEN ROADS REHAB. & MTCE (incl. RESEAL) COSTS

INPUT COSTS		
Council		
Seal Width	Rehabilitation Costs	Annual Routine Mtce.
m	$ / km	$ / km
3.6	$828,000	$4,700
4	$920,000	$5,070
4.5	$1,035,000	$5,720
5	$1,150,000	$6,000
5.5	$1,265,000	$7,900
6	$1,380,000	$9,800
6.5	$1,495,000	$9,450
7	$1,610,000	$9,100
7.5	$1,725,000	$9,700
8	$1,840,000	$10,300
8.5	$1,955,000	$10,650
9	$2,070,000	$11,000
9.5	$2,185,000	$11,600
10	$2,300,000	$12,200
10.5	$2,415,000	$12,550
11	$2,530,000	$12,900
11.5	$2,645,000	$13,500
12	$2,760,000	$14,100
Base year for the above costs =		2016

OTHER INPUT DATA

(a) ESA's / HV = 2.9 ESA's/HV (Bruce Hwy)
= 3.2 ESA's/HV (All Other Roads)

(b) Roughness Increase = 3 counts per year

(c Terminal Roughness*= 110 NRM (Bruce Hwy)
= 120 NRM (All other Roads)

(d) Inflation Rate = 7%

(e) Discount Rate = 6%

(f) HV Growth Rate (background traffic) = adopt a constant 3% for all road sections, unless agreed otherwise by Central District.

*Note :- Terminal Roughness is considered to be a more realistic indicator of rehabilitation timing than pavement age or other methods of estimating the life of the existing pavement.

Vehicle Combination / ESA Calculation 1

Bus / Truck   O O

	Axles / Tyres	Single / Single	Single / Dual						Totals	
	Legal Loading (t)	6	9						15.00	tonne
	Base Load / ESA	5.4	8.2							
Unloaded	Axle Group Load (t)	4.5	4						8.5	tonne
	ESA's	0.482	0.057						0.54	ESA
Loaded	Axle Group Load (t)	6.00	9.00						15.00	tonne
	ESA's [1]	1.524	1.451						2.98	ESA
	Payload =	6.5	tonne					ESA/t Payload =	0.0829	unloaded
	Max Legal Payload =	6.5	tonne [2]					ESA/t Payload =	0.4577	loaded

Tandem Truck   O OO

	Axles / Tyres	Single / Single	Tandem / Dual						Totals	
	Legal Loading (t)	6	16.5						22.50	tonne
	Base Load / ESA	5.4	13.8							
Unloaded	Axle Group Load (t)	4.5	5						9.5	tonne
	ESA's	0.482	0.017						0.50	ESA
Loaded	Axle Group Load (t)	6.00	16.50						22.50	tonne
	ESA's [1]	1.524	2.044						3.57	ESA
	Payload =	13.0	tonne					ESA/t Payload =	0.0384	unloaded
	Max Legal Payload =	13.0	tonne [2]					ESA/t Payload =	0.2745	loaded

Semi-Trailer   O OO OOO

	Axles / Tyres	Single / Single	Tandem / Dual	Tri / Dual					Totals	
	Legal Loading (t)	6	16.5	20.00					42.50	tonne
	Base Load / ESA	5.4	13.8	18.5						
Unloaded	Axle Group Load (t)	4.5	5	6.5					16	tonne
	ESA's	0.482	0.017	0.015					0.51	ESA
Loaded	Axle Group Load (t)	6.00	16.50	20.00					42.50	tonne
	ESA's [1]	1.524	2.044	1.366					4.93	ESA
	Payload =	26.5	tonne					ESA/t Payload =	0.0194	unloaded
	Max Legal Payload =	26.5	tonne [2]					ESA/t Payload =	0.1862	loaded

B-Double   O OO OOO OOO

	Axles / Tyres	Single / Single	Tandem / Dual	Tri / Dual	Tri / Dual				Totals	
	Legal Loading (t)	6	16.5	20.00	20.00				62.50	tonne
	Base Load / ESA	5.4	13.8	18.5	18.5					
Unloaded	Axle Group Load (t)	4.5	5	6.5	6.5				22.5	tonne
	ESA's	0.482	0.017	0.015	0.015				0.53	ESA
Loaded	Axle Group Load (t)	6.00	16.50	20.00	20.00				62.50	tonne
	ESA's [1]	1.524	2.044	1.366	1.366				6.30	ESA
	Payload =	40.0	tonne					ESA/t Payload =	0.0132	unloaded
	Max Legal Payload =	40.0	tonne [2]					ESA/t Payload =	0.1575	loaded

Road Train 1   O OO OOO OOO OOO

	Axles / Tyres	Single / Single	Tandem / Dual	Tri / Dual	Tri / Dual	Tri / Dual			Totals	
	Legal Loading (t)	6	16.5	20.00	20.00	20.00			82.50	tonne
	Base Load / ESA	5.4	13.8	18.5	18.5	18.5				
Unloaded	Axle Group Load (t)	4.5	5	6.5	6.5	6.5			29	tonne
	ESA's	0.482	0.017	0.015	0.015	0.015			0.55	ESA
Loaded	Axle Group Load (t)	6.00	16.50	20.00	20.00	20.00			82.50	tonne
	ESA's [1]	1.524	2.044	1.366	1.366	1.366			7.67	ESA
	Payload =	53.5	tonne					ESA/t Payload =	0.0102	unloaded
	Max Legal Payload =	53.5	tonne [2]					ESA/t Payload =	0.1433	loaded

[1] If the "payload" is more or less than legal, "axle group loadings" are proportioned based on the legal and the unloaded tonnages.

[2] Calculated from the max legal loads & generic unloaded (tare) weights for each axle group of the HV.

Vehicle Combination / ESA Calculation 2

	Truck + 4 Dog	O	OO	OO	OO					
	Axles Tyres	Single Single	Tandem Dual	Tandem Dual	Tandem Dual				Totals	
	Legal Loading (t)	6	16.5	16.50	16.50				55.50	tonne
	Base Load / ESA	5.4	13.8	13.8	13.8					
Unloaded	Axle Group Load (t)	4.5	5	5	5				19.5	tonne
	ESA's	0.482	0.017	0.017	0.017				0.53	ESA
Loaded	Axle Group Load (t)	6.00	16.50	16.50	16.50				55.50	tonne
	ESA's [1]	1.524	2.044	2.044	2.044				7.66	ESA
	Payload =	36.0	tonne			ESA/t Payload =			0.0148	unloaded
	Max Legal Payload =	36.0	tonne [2]			ESA/t Payload =			0.2126	loaded

	AB Triple	O	OO	OOO	OOO	OOO	OOO			
	Axles Tyres	Single Single	Tandem Dual	Tri Dual	Tri Dual	Tri Dual	Tri Dual		Totals	
	Legal Loading (t)	6	16.5	20.00	20.00	20.00	20.00		102.50	tonne
	Base Load / ESA	5.4	13.8	18.5	18.5	18.5	18.5			
Unloaded	Axle Group Load (t)	4.5	5	6.5	6.5	6.5	6.5		35.5	tonne
	ESA's	0.482	0.017	0.015	0.015	0.015	0.015		0.56	ESA
Loaded	Axle Group Load (t)	6.00	16.50	20.00	20.00	20.00	20.00		102.50	tonne
	ESA's [1]	1.524	2.044	1.366	1.366	1.366	1.366		9.03	ESA
	Payload =	67	tonne			ESA/t Payload =			0.0084	unloaded
	Max Legal Payload =	67.0	tonne [2]			ESA/t Payload =			0.1348	loaded

		O	OO							
	Axles Tyres	Single Single	Tandem Dual						Totals	
	Legal Loading (t)	6	16.5						22.50	tonne
	Base Load / ESA	5.4	13.8							
Unloaded	Axle Group Load (t)								0	tonne
	ESA's	0.000	0.000						0.00	ESA
Loaded	Axle Group Load (t)	0.00	0.00						0.00	tonne
	ESA's [1]	0.000	0.000						0.00	ESA
	Payload =		tonne			ESA/t Payload =			#DIV/0!	unloaded
	Max Legal Payload =	22.5	tonne [2]			ESA/t Payload =			#DIV/0!	loaded

Unloaded Vehicles				
HV Type	ESA / t (payload)	% of HV fleet	Weigthed Average	
Bus / Truck	0.0829			
Tandem Truck	0.0384	6.0%	0.0023	
Semi-Trailer	0.0194	34.0%	0.0066	
B-Double	0.0132			
Road Train 1	0.0102			
Truck + 4 Dog	0.0148	60.0%	0.0089	
AB Triple	0.0084			
0				
		100.0%	0.0178	ESAs / tonne of product "out the gate"

Loaded Vehicles				
HV Type	ESA / t (payload)	% of HV fleet	Weigthed Average	
Bus / Truck	0.4577			
Tandem Truck	0.2745	6.0%	0.0165	
Semi-Trailer	0.1862	34.0%	0.0633	
B-Double	0.1575			
Road Train 1	0.1433			
Truck + 4 Dog	0.2126	60.0%	0.1276	
AB Triple	0.1348			
0				
		100.0%	0.2074	ESAs / tonne of product "out the gate"

MRD INPUT DATA

Start of Development Traffic = 2022 (= PV Base Yr.)

Development Duration = 20 years

ESA Increase Trigger = 5.0%

Roughness Increase = 3 Counts / yr

Treasury Discount Rate = 6.0%

ROAD SECTIONS AND LENGTHS							ARMIS TRAFFIC DATA			CONDITION AND STANDARDS				UNIT COSTS - Inflated up from Base Yr.			
														Inflation % =	7.0%	Inflation % =	7.0%
														Rehab. Costs		Mtce. Costs	
														Base Year	PV Base Yr.	Base Year	PV Base Yr.
								2022			2022			**2016**	2022	**2016**	2022
Sect. No.	Road No.	Road Name	Road Sections	Ch.	Ch	Length (km)	AADT 2022	HV %	Growth Adopt	ESA per HV	Exist. Rough	Terminal Rough.	Seal Width	$/km	$/lane-km	Mtce $/km	$/lane-km
1	1	Nine Mile Road	0-0.5km (from Ridgelands Road)	0.0	0.5	0.5	470	35.9	1.0%	3.2	143	120	7.8	$1,725,000	$1,294,380	$9,700	$7,279
2	1	Nine Mile Road	0.5-1.0km (from Ridgelands Road)	0.5	1.0	0.5	470	35.9	1.0%	3.2	157	120	7.8	$1,725,000	$1,294,380	$9,700	$7,279
3	1	Nine Mile Road	1.0-1.5km (from Ridgelands Road)	1.0	1.5	0.5	470	35.9	1.0%	3.2	132	120	7.6	$1,725,000	$1,294,380	$9,700	$7,279
4	1	Nine Mile Road	1.5-2.0km (from Ridgelands Road)	1.5	2.0	0.5	470	35.9	1.0%	3.2	146	120	7.6	$1,725,000	$1,294,380	$9,700	$7,279
5	1	Nine Mile Road	2.0-2.5km (from Ridgelands Road)	2.0	2.5	0.5	470	35.9	1.0%	3.2	159	120	7.4	$1,610,000	$1,208,088	$9,100	$6,828
6	1	Nine Mile Road	2.5-.30km (from Ridgelands Road)	2.5	3.0	0.5	470	35.9	1.0%	3.2	172	120	7.4	$1,610,000	$1,208,088	$9,100	$6,828
7	1	Nine Mile Road	3.0-3.5km (from Ridgelands Road)	3.0	3.5	0.5	470	35.9	1.0%	3.2	156	120	7.2	$1,610,000	$1,208,088	$9,100	$6,828
8	1	Nine Mile Road	3.5-4.0km (from Ridgelands Road)	3.5	4.0	0.5	470	35.9	1.0%	3.2	122	120	6.6	$1,495,000	$1,121,796	$9,450	$7,091
9	1	Nine Mile Road	4.0-4.5km (from Ridgelands Road)	4.0	4.5	0.5	470	35.9	1.0%	3.2	131	120	6.6	$1,495,000	$1,121,796	$9,450	$7,091
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					Total =	4.5											

Increase Trigger = 5.0%

Routine Mtce Contribution Calculation

	Link Data			Mtce Costs at PV Base Year (2022)		
Sect. No.	Road No.	Road Name	Length (km)	ESA's/lane per Year	Routine Mtce $/lane-km/yr	Unit Cost $/ESA/km/yr
1	1	0-0.5km (from Ridgelands Road)	0.5	9.85E+04	$7,279	$0.0739
2	1	0.5-1.0km (from Ridgelands Road)	0.5	9.85E+04	$7,279	$0.0739
3	1	1.0-1.5km (from Ridgelands Road)	0.5	9.85E+04	$7,279	$0.0739
4	1	1.5-2.0km (from Ridgelands Road)	0.5	9.85E+04	$7,279	$0.0739
5	1	2.0-2.5km (from Ridgelands Road)	0.5	9.85E+04	$6,828	$0.0693
6	1	2.5-.30km (from Ridgelands Road)	0.5	9.85E+04	$6,828	$0.0693
7	1	3.0-3.5km (from Ridgelands Road)	0.5	9.85E+04	$6,828	$0.0693
8	1	3.5-4.0km (from Ridgelands Road)	0.5	9.85E+04	$7,091	$0.0720
9	1	4.0-4.5km (from Ridgelands Road)	0.5	9.85E+04	$7,091	$0.0720
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		Total =	4.5			

	TO(WARDS) Development - PV of Increases in Mtce Costs (year by year)								Discount Rate =	6.0%	
Sect. No.	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	PV Total
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	FROM Development - PV of Increases in Mtce Costs (year by year)								Discount Rate =	6.0%	
Sect. No.	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	PV Total
1	$1,149	$1,084	$1,022	$964	$910	$858	$810	$764	$721	$680	$8,962
2	$1,149	$1,084	$1,022	$964	$910	$858	$810	$764	$721	$680	$8,962
3	$1,149	$1,084	$1,022	$964	$910	$858	$810	$764	$721	$680	$8,962
4	$1,149	$1,084	$1,022	$964	$910	$858	$810	$764	$721	$680	$8,962
5	$1,078	$1,017	$959	$905	$854	$805	$760	$717	$676	$638	$8,408
6	$1,078	$1,017	$959	$905	$854	$805	$760	$717	$676	$638	$8,408
7	$1,078	$1,017	$959	$905	$854	$805	$760	$717	$676	$638	$8,408
8	$1,119	$1,056	$996	$940	$886	$836	$789	$744	$702	$662	$8,731
9	$1,119	$1,056	$996	$940	$886	$836	$789	$744	$702	$662	$8,731
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											$78,534

Rehabilitation Contribution Calculation

					Rehab. Year **WITHOUT** Dev Traffic. Based on 2022 Roughness Data				Rehab Design Life = 20	PVT. Life **WITHOUT** Dev. Traffic - (Dev. Start to Rehab. Year)			**To(wards)** Development: Reduced PVT. Life **WITH** Dev. Traffic - (Dev. Start to Rehab. Year)				Discount Rate = 6.0%; PV - Rehab.		**From** Development: Reduced PVT. Life **WITH** Dev. Traffic - (Dev. Start to Rehab. Year)				Discount Rate = 6.0%; PV - Rehab.	
Sect No.	Road No.	Road Name	Road Sections	Length (km)	Exist. Roughness	Roughness at fail	Years to failure	Rehab. Yr. (Rough)	Rehab. Year for Contrib Calc	Years to Rehab. From Dev Start	ESA's/yr at Dev Start (2022)	Cumul.B'gr ESA (Dev Start to Rehab)	Cumul. Dev Traffic	Reduced B'ground ESA's to Rehab	Years to Rehab (with Dev)	Reduced Pvt. Life (years)	Bring Forward Factor	Dev. Contrib.	Cumul. Dev Traffic	Reduced B'ground ESA's to Rehab	Reduced years to Rehab.	Reduced Pvt. Life (years)	Bring Forward factor	Dev. Contrib.
					1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
1	1	Nine Mile Road	0-0.5km (from Ridgelands Road)	0.5	143	120	-7.7	2014	2034	12.3	9.85E+04	1.30E+06	26,713	1272755	12.1	0.24	0.0068	$4,421	311,036	9.88E+05	9.5	2.82	0.0870	$56,275
2	1	Nine Mile Road	0.5-1.0km (from Ridgelands Road)	0.5	157	120	-12.3	2010	2030	7.7	9.85E+04	7.89E+05	26,713	7.62E+05	7.4	0.25	0.0094	$6,081	311,036	4.78E+05	4.7	2.95	0.1201	$77,739
3	1	Nine Mile Road	1.0-1.5km (from Ridgelands Road)	0.5	132	120	-4.0	2018	2038	16.0	9.85E+04	1.72E+06	26,713	1.69E+06	15.8	0.23	0.0053	$3,442	311,036	1.41E+06	13.3	2.71	0.0675	$43,665
4	1	Nine Mile Road	1.5-2.0km (from Ridgelands Road)	0.5	146	120	-8.7	2013	2033	11.3	9.85E+04	1.19E+06	26,713	1.16E+06	11.1	0.24	0.0073	$4,734	311,036	8.77E+05	8.5	2.85	0.0932	$60,309
5	1	Nine Mile Road	2.0-2.5km (from Ridgelands Road)	0.5	159	120	-13.0	2009	2029	7.0	9.85E+04	7.18E+05	26,713	6.91E+05	6.7	0.25	0.0098	$5,940	311,036	4.07E+05	4.0	2.97	0.1258	$75,985
6	1	Nine Mile Road	2.5-.30km (from Ridgelands Road)	0.5	172	120	-17.3	2005	2025	2.7	9.85E+04	2.68E+05	26,713	2.41E+05	2.4	0.26	0.0132	$7,986	311,036	-4.34E+04	-0.4	3.11	0.1698	$102,597
7	1	Nine Mile Road	3.0-3.5km (from Ridgelands Road)	0.5	156	120	-12.0	2010	2030	8.0	9.85E+04	8.25E+05	26,713	7.98E+05	7.8	0.25	0.0092	$5,548	311,036	5.14E+05	5.1	2.94	0.1174	$70,901
8	1	Nine Mile Road	3.5-4.0km (from Ridgelands Road)	0.5	122	120	-0.7	2021	2041	19.3	9.85E+04	2.11E+06	26,713	2.08E+06	19.1	0.22	0.0042	$2,376	311,036	1.80E+06	16.7	2.63	0.0536	$30,052
9	1	Nine Mile Road	4.0-4.5km (from Ridgelands Road)	0.5	131	120	-3.7	2018	2038	16.3	9.85E+04	1.76E+06	26,713	1.73E+06	16.1	0.23	0.0052	$2,916	311,036	1.45E+06	13.6	2.71	0.0659	$36,981
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																		$43,445						$554,503

APPENDIX 3

Estimated Background Traffic ESA'S at Development Start Date (2022)

Pavement Design Life = 20 yrs

				Estimated ESA's per Year at Dev Start (2022)									Design Traffic (20 yr life)	*Background ESAs **(EACH LANE)** Year by Year without Dev.*										Cumul. B'ground ESAs
Sect. No.	Link	Road Section	Length (km)	AADT Traffic (HV/day)						HV per ***LANE***	ESA per HV	ESA's per Yr (2022)		1	2	3	4	5	6	7	8	9	10	
				2022	% HV	Growth	**2022**	%HV	Heavy					2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
1	1	0-0.5km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
2	1	0.5-1.0km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
3	1	1.0-1.5km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
4	1	1.5-2.0km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
5	1	2.0-2.5km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
6	1	2.5-.30km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
7	1	3.0-3.5km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
8	1	3.5-4.0km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
9	1	4.0-4.5km (from Ridgelands Road)	0.5	470	35.9	1.0%	470	35.9	169	84	3.2	98,538	2.19E+06	9.85E+04	9.95E+04	1.01E+05	1.02E+05	1.03E+05	1.04E+05	1.05E+05	1.06E+05	1.07E+05	1.08E+05	1.03E+06
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Development Generated ESA's per Year

"Base" Annual Tonnage = 150,000

	Development Generated Tonnages (Year by Year)										
	1	2	3	4	5	6	7	8	9	10	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
% of "Base" Annual Tonnage	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	Total
Annual Tonnage	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	1,500,000

Sect	Road	Road Name	Road Section		Av. ESA / t		**TO(WARDS)** - Development Generated ESA's (Year by Year)										Cumul.
							1	2	3	4	5	6	7	8	9	10	Dev Traffic
No.	No.			%	To	From	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	ESA's
1	1	Nine Mile Road	0-0.5km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
2	1	Nine Mile Road	0.5-1.0km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
3	1	Nine Mile Road	1.0-1.5km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
4	1	Nine Mile Road	1.5-2.0km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
5	1	Nine Mile Road	2.0-2.5km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
6	1	Nine Mile Road	2.5-.30km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
7	1	Nine Mile Road	3.0-3.5km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
8	1	Nine Mile Road	3.5-4.0km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
9	1	Nine Mile Road	4.0-4.5km (from Ridgelands Road)	100.0%	0.0178	0.2074	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+03	2.67E+04
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Sect	**(AWAY) FROM** - Development Generated ESA's (Year by Year)										Cumul.
	1	2	3	4	5	6	7	8	9	10	Dev Traffic
No.	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	ESA's
1	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
2	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
3	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
4	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
5	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
6	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
7	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
8	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
9	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+04	3.11E+05
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Parked Formula

Parked Formula

<u>Development Generated ESA % (Year by Year)</u>

ESA Increase Trigger = 5.0%

					TO(WARDS) - Development Generated % Year by Year										**FROM** - Development Generated % Year by Year									
Sect No.	Road No.	Road Name	Road Section	Length	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
					2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	1	Nine Mile Road	0-0.5km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
2	1	Nine Mile Road	0.5-1.0km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
3	1	Nine Mile Road	1.0-1.5km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
4	1	Nine Mile Road	1.5-2.0km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
5	1	Nine Mile Road	2.0-2.5km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
6	1	Nine Mile Road	2.5-.30km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
7	1	Nine Mile Road	3.0-3.5km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
8	1	Nine Mile Road	3.5-4.0km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
9	1	Nine Mile Road	4.0-4.5km (from Ridgelands Road)	0.5	2.7%	2.7%	2.7%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%	2.5%	31.6%	31.3%	30.9%	30.6%	30.3%	30.0%	29.7%	29.4%	29.1%	28.9%
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GROUNDWORK plus

ROCKHAMPTON SANDS QUARRY

ENVIRONMENTAL MANAGEMENT PLAN

Prepared for:
Nine Mile Sands Pty Ltd
(T/a Rockhampton Sands)

Rockhampton SANDS

Date:
June 2022

File Ref:
documents / 2493_610_002_R2

ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

19 April 2023

DATE

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/589-2013

Dated: 9 June 2016

Document Control

Project/ Report Details

Document Title:	Rockhampton Sands Quarry Environmental Management Plan
Principal Author:	Y. Dowling
Client:	Nine Mile Sands Pty Ltd (T/a Rockhampton Sands)
Ref. No.	2493_610_002_R2

Document Status

Issue	*Description*	*Date*	*Author*	*Reviewer*
0	Environmental Management Plan	October 2021	Y. Dowling	D. Doolan / J. Lawler
1	Environmental Management Plan	November 2021	Y. Dowling	D. Doolan / J. Lawler
2	Revised to incorporate Acid Sulfate Soils Management Plan and remove reference to operation on Sundays.	June 2022	Y. Dowling	D. Doolan

Distribution Record

Recipient	*Distribution Method(s)*
Nine Mile Sands Pty Ltd (T/a Rockhampton Sands)	Electronic x 1
Department of Environment and Science	Electronic x 1

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1. Introduction

1.1 Background

Nine Mile Sands Pty Ltd, trading as Rockhampton Sands, is the operator of the extractive industry operation located at 250 Fogarty Road, Fairy Bower, QLD 4700. Rockhampton Sands operate the site under an Environmental Authority ('EA') which applies to Lot 250 on R2621, Lot 1 RP603316 and Lot 4 LN883; however, all operations occur on Lot 250 only and comprise of the following Prescribed Environmentally Relevant Activities ('ERAs') under the *Environmental Protection Regulation 2019* ('EP Reg'):

- ERA 16 Threshold (2)(b) Extracting, other than by dredging, in a year, the following quantity of material – more than 100,000 tonnes per year but not more than 1,000,000 tonnes per year; and
- ERA 16 Threshold (3)(b) Screening, in a year, the following quantity of material – more than 100,000 tonnes per year but not more than 1,000,000 tonnes per year.

Figure 1 **–** Site Layout Plan provides an illustration of the site layout.

Figure 1 **–** Site Layout Plan

(Figure reprinted from Queensland Globe (2021))

This Environmental Management Plan (EMP) describes the site operations, the potential environmental impacts of these activities, and how any potential impacts may be mitigated or managed to achieve acceptable environmental outcomes of for the activity.

1.2 Site Details

Table 1 – Site Details Summary provides a summary of the site location details.

Table 1 – Site Details Summary

Address	250 Fogarty Road, Fairy Bower, QLD 4700
Real Property Description	Lot 250 on R2621
Tenure	Freehold
Site Area (Lot 25 Only)	36.422 hectares
Local Authority	Rockhampton Regional Council

1.3 Activity Overview

Included as Diagram 1 - Conceptual On-Site Extractive Operations is an illustration of the quarry development. The quarry operations are anticipated to comprise the following basic elements:

- Stripping of any topsoil and overburden (note that these are inherently minimal at the site due to the natural geology).
- Stockpiling any available topsoil / overburden for future use as saleable general fill, incorporation into onsite rehabilitation works, or use in construction of stormwater controls (e.g., perimeter banks / bunds).
- Delivering material directly to wash plant via dredge and associated piping.
- Washing and screening of raw materials.
- Directing water pumped into wash plant through silt traps and back into the pit as clean water.
- Stockpiling the final products in a designated area before the material is sold and loaded into trucks for transportation off-site for use.
- Rehabilitating disturbed areas progressively once the terminal quarry benches have been established.

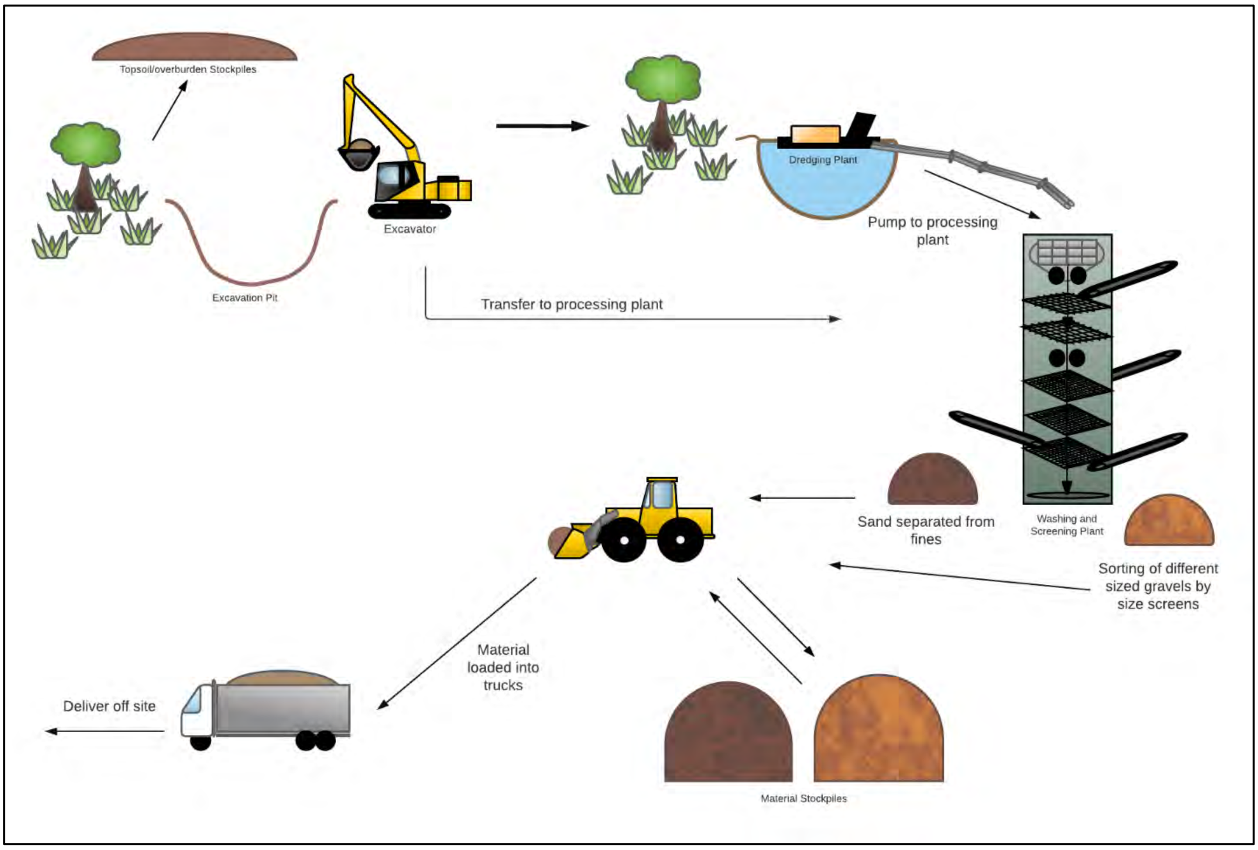

Diagram 1 – Conceptual On-Site Extractive Operations

1.4 Plant and Equipment

The operations are supported by a range of ancillary building and structures including, but not limited to:

- Site office and amenities block, car park and truck parking areas.
- Storage container and excess equipment area.
- Internal haul and access roads.

The number of plant and equipment deployed on-site is anticipated to vary from time-to-time to service the project demands. Types of major plant and equipment deployed on-site may include, but not limited to:

- Grader;
- Excavator;
- Moxy dump truck;
- Front end loader;
- Processing plant;
- Wash plant;
- Dredge;
- Water cart;
- Haul road trucks.

Equipment will generally be serviced in the field unless it is practical for the parts to be dismantled and transported to the workshop. Consumables (e.g., tyres, oils and greases) will be supplied by contractors and removed (including associated packaging) for disposal off-site in accordance with the requirements of the prevailing legislation and the local authority on a regular basis.

1.5 Hours of Operation

The hours of operation are 6:00am to 6:00pm Monday to Saturday, and no operations on Sundays or public holidays.

1.6 Purpose of the EMP

This EMP has been prepared to provide written procedures for the site activities that:

a) identify potential risks to the environment from the activity during routine operations and emergencies; and
b) establish and maintain control measures that minimise the potential for environmental harm; and
c) ensure plant, equipment and measures are maintained in a proper and effective condition; and
d) ensure plant, equipment and measures are operated in a proper and effective manner; and
e) ensure that staff are trained and aware of their obligations under the EP Act; and
f) ensure that reviews of environmental performance are undertaken at least annually.

1.7 Relevant Legislation

In Queensland, the EP Act is the principal legislation for protecting the environment. The EP Act was assented on 1 December 1994 and was proclaimed on 1 March 1995. The object of the EP Act is to:

> "*protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development)".*

The EP Act imposes a General Environmental Duty on corporations, government departments and individuals, in order to meet the primary objective (s319 of the EP Act). The duty relates to the notion that everyone must take all reasonable and practicable measures to prevent or minimise environmental harm. The general environmental duty is extracted below for reference:

319 General environmental duty

1. *A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm (the general environmental duty).*

   Note— See section 24 (3) (Effect of Act on other rights, civil remedies etc.).

2. *In deciding the measures required to be taken under subsection (1), regard must be had to, for example—*
   a) *the nature of the harm or potential harm; and*
   b) *the sensitivity of the receiving environment; and*
   c) *the current state of technical knowledge for the activity; and*
   d) *the likelihood of successful application of the different measures that might be taken; and*
   e) *the financial implications of the different measures as they would relate to the type of activity.*

In addition, the EP Act states that it is an offence to cause environmental nuisance (s440 of EP Act), material environmental harm (s438 of EP Act), serious environmental harm (s437 of EP Act), and it is an offence to contravene a condition of an Environmental Authority (s430 of EP Act).

2. Policies and Procedures

2.1 Staff Training

All site personnel, including contractors, are to be inducted on the environmental management requirements for the site and informed of the environmental management objectives and specifics of the EMP as well as obligations under the *Environmental Protection Act 1994*. Training may include awareness on impact minimisation measures, operational practices, maintenance measures, reporting, and individual responsibilities.

Site personnel are to be made aware of penalties if conditions of approval are breached and reporting requirements for incidents involving environmental nuisance and/or harm in accordance with the relevant environmental legislation. A record of all employee training is to be maintained on-site.

2.2 Communication

Communication must take place regarding environmental matters at the site between operational personnel, management and external stakeholders.

Internal communication mechanisms relating to environmental matters and potential impacts, objectives and targets, training and awareness, complaints and incidents, and suggestions for improvement may include, but shall not be limited to:

- Self-assessments and audits.
- Action requests, memos, noticeboards, etc.
- Environmental incident reporting.
- Environmental compliance monitoring and reporting.
- Inductions and environmental awareness training.
- Toolbox talks or verbal advice.
- Weekly construction meetings.
- Management reviews.
- Site meetings.

All external communications are to be undertaken by management. External communication mechanisms for environmental matters may include:

- Formal and informal correspondence with the administering authorities
- Formal correspondence with interest groups
- Community complaints and enquiries.

2.3 Complaint Recording and Response

All complaints received are to be reported to the Operations Manager or delegate immediately.

The following details are to be recorded upon receipt of any complaint:

- Date and time the complaint was received.
- Name and contact details for the complainant when provided and authorised by the complainant.
- Nature of the complaint.
- Investigation undertaken.
- Conclusions formed.
- Actions taken.

The Operations Manager is to liaise with any complainants to discuss the nature of the complaint and to determine a suitable resolution. Initial contact with the complainant is to be made within 24 hours of the complaint being received to initiate a resolution to the matter.

The administering authority may request additional monitoring to investigate any complaint of environmental nuisance received directly by the administering authority. A copy of any monitoring results must be provided within 10 business days to the administering authority.

2.4 Incident Response Procedure

2.4.1 Overview

The objective of this Incident Response Procedure is to ensure that any breaches of the EA, or incidents and activities that cause or threaten to cause serious or material environmental harm, are reported, investigated, and addressed to prevent recurrence or remedy harm caused. A diagrammatic overview of incidents procedure is provided in Diagram 2 – Incident Response Procedure Overview. The Operations Manager will be responsible for ensuring that all employees at the site are familiar with the procedure for incidents procedures.

Environmental harm is defined under the EP Act as:

- any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.
- may be caused by an activity—
    - o whether the harm is a direct or indirect result of the activity; or
    - o whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors.

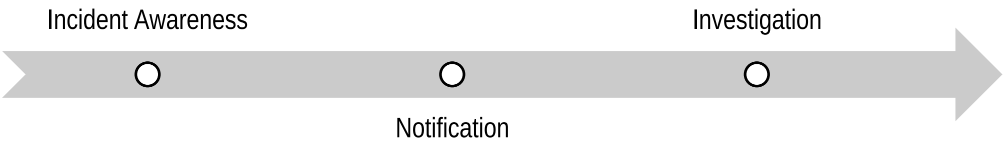

Diagram 2 – Incident Response Procedure Overview

2.4.2 Incident Awareness

When an employee becomes aware of an event resulting in the breach of an EA condition, or an incident with actual or potential environmental harm implications, the employee must report the incident to the Operations Manager or delegate immediately (no more than 24 hours after becoming aware of the incident).

To demonstrate regard for the general environmental duty, all possible breaches of the EA should be reported to the administering authority as soon becoming aware of the matter, even if there is uncertainty as to whether a condition of the EA has been breached.

2.4.3 Initial Notification

If the matter is an emergency, call 000.

Under Sections 320 to 320G of the EP Act, persons have a duty to notify the administering authority within 24 hours of becoming aware of any incidents or activities that cause or threaten to cause serious environmental harm or material environmental harm. In addition, the EA requires that any breach of a condition of the EA is reported no more than as soon as practicable within 24 hours of becoming aware of the breach.

The Operations Manager must notify the administering authority via telephone and email within 24 hours of becoming aware of the incident. The contact details of the administering authority for notification purposes are as follows:

Department of Environment and Science
Phone: 1300 130 372 and select option 2 (during business hours of 8.30am to 5.00pm)
Email: PollutionHotline@des.qld.gov.au

Notification must include the following where known:

- Contact details for a site representative.
- Details of the affected land (e.g., site address, real property description, local government area, maps / plans of affected areas).
- EA reference number.
- Nature of the activity / circumstances that led to the incident.
- Timeframes for the event and when staff became aware (date and time).
- Event type (e.g., spill, fire, leaks, release, etc), source and environment affect (e.g. waterways, drains, land, etc).
- Details of any potential contaminants.
- Actions taken to resolve or remedy potential impacts.

All records of the incident or breach are to be stored at the site and made available to the administering authority upon request.

2.4.4 Further Notification

Within seven (7) days of the initial notification, a written notice detailing the following information must be provided to the administering authority:

- Operator name, including the EA number;
- Name and telephone number of a designated contact person;
- Quantity and nature of the substance released (if relevant).
- Vehicle and registration details (if relevant)
- Names of person/s involved in the release and/or clean-up;
- Location and time of the incident / release.
- Suspected cause of the incident / release.
- Description of the effects of the incident / release.
- Details of the area of impact.;
- Results of any sampling performed in relation to the release.
- Actions taken to mitigate any environmental harm caused by the release and details of the success of these actions.
- Proposed actions to prevent a recurrence of the release.

2.4.5 Investigation

All incidents are to be investigated. The investigations should include:

- determining what activities were being carried out at the time of the incident and any equipment involved.
- identifying whether equipment or activities on-site were the cause of the incident.
- determining what potential actions may be carried out to resolve the matter and/or minimise the likelihood of further impacts.

Corrective action is to be implemented and an assessment conducted to determine what actions are to be taken to remedy the matter and/or prevent a similar incident from occurring.

Where monitoring is required to investigate an incident (e.g., water quality monitoring), a suitably qualified person as identified under the EP Act must be engaged to perform the monitoring and interpret any results.

2.5 Record Keeping

All environmentally relevant documentation, including approvals, corporate policies, procedures, forms, records, and reports required to be kept as per this EMP or conditions of approval shall be available at the approved premises for a period of at least five (5) years, and must be available for inspection by an authorised person.

2.6 Monitoring

Any monitoring required by a condition of approval or by this EMP must be carried out by a suitably qualified person(s) as defined under the EP Act.

All instruments, equipment and measuring devices used for measuring or monitoring in accordance with a condition of approval must be calibrated and appropriately operated and maintained.

All analyses of samples must be carried out by a laboratory that has National Association of Testing Authorities (NATA) certification, or an equivalent certification, for such analyses.

2.7 Periodic Review of Environmental Performance and Continual Improvement

The EMP has been prepared for implementation as a continuous improvement program. The following key aspects of this EMP ensures continuous improvement results from the implementation of this EMP.

Commitment and Environmental Policy
Senior management are to commit to environmental performance through ensuring regulatory compliance, prevention of actual or potential environmental harm, and continuous improvement.

Planning
The EMP identifies environmental aspects associated with the site operations, such as potential impacts. EMP outlines the environmental objectives, performance targets and management measures for each environmental aspect.

Implementation
Implementation of the EMP outlines responsibilities, training requirements, communication procedures, and contingency plans. Rockhampton Sands will be responsible for ensuring additional implementation requirements are in place, such as preparing monitoring documentation, following procedures, and establishing communication pathways.

Checking
Monitoring of compliance will determine whether the environmental objectives are being met and will identify non-compliances. Additional actions that will check environmental performance include audits and review of the EMP.

Review
Reviews of environmental performance are to be undertaken at least <u>annually</u> and should review:

- any monitoring data produced under the conditions of the EA and any trends.
- any non-compliances reported, or complaints received, over the preceding 12 months and actions taken to achieve compliance / resolution.
- changes in site approval documents, legislation and standards.
- the suitability of the EMP against the site development.
- any measures that are proposed to be implemented over the coming 12 months to improve the environmental performance of the site.

A template for annual environmental performance reviews is included as Attachment 1 – Annual Environmental Performance Review.

The outcomes of all environmental performance reviews must be communicated to senior management for actioning as required.

The Operations Manager may commission updates to this EMP as required to ensure that it meets the operational needs of the site. Periodic review of the EMP will ensure continuous improvement of the site environmental performance through adaption of management strategies to meet the changing needs of the site.

3. Potential Environmental Risks

3.1 Risk Assessment Methodology

The purpose of this assessment is to determine the site activities requiring ongoing management to reduce residual risk of potential environmental impacts. This risk assessment methodology has been adopted from the process for risk management as set out in Clause 6 of the *AS ISO 31000:2018 Risk management - Guidelines* (Standards Australia 2018). The risk assessment follows the following process:

- Risk Identification (source activity and potential impact).
- Risk Analysis (risk level = likelihood x consequence).
- Risk Evaluation (commentary on risk / management measures proposed).

The risk treatment outlines the controls / management measures that can be implemented to reduce the level of risk to as low as reasonably possible.

The risk analysis qualitatively estimates the level of risk based on the likelihood of an environmental impact or event occurring (Table 2 – Definitions of Likelihood), and the consequences of the occurrence (Table 3 – Definitions of Consequence).

Table 2 – Definitions of Likelihood

Rating	Descriptor	Score
Rare	May occur only in exceptional circumstances	1
Unlikely	Could occur but doubtful	2
Possible	Might occur at some time in the future	3
Likely	Will probably occur	4
Almost Certain	Is expected to occur in most circumstances	5

Table 3 – Definitions of Consequence

Rating	Descriptor	Score
Negligible	Impacts not requiring any treatment or management action	1
Minor	Nuisance or insignificant environmental harm requiring minor management action	2
Moderate	Serious environmental impacts, readily manageable at low cost	3
Major	Substantial environmental impacts, manageable but at considerable cost and some disruption	4
Severe	Severe environmental impacts with major consequent disruption and heavy cost	5

The consequence and likelihood scores are plotted on the risk vs consequence matrix (Table 4 – Risk Assessment Matrix) and the final risk level assigned is a product of the likelihood and consequence scores, which equals the magnitude of the impacts. The higher the risk score, the higher the priority is for management.

Table 4 – Risk Assessment Matrix

Likelihood		Consequence				
		Negligible	Minor	Moderate	Major	Severe
		1	2	3	4	5
Almost Certain	5	5 Medium	10 High	15 High	20 Very High	25 Very High
Likely	4	4 Low	8 Medium	12 High	16 High	20 Very High
Possible	3	3 Low	6 Medium	9 Medium	12 High	15 High
Unlikely	2	2 Low	4 Low	6 Medium	8 Medium	10 High
Rare	1	1 Low	2 Low	3 Low	4 Low	5 Medium

Table 5 – Indicative Management Option for Each Risk Assessment Rating describes the possible actions required for each risk assessment rating.

Table 5 – Indicative Management Option for Each Risk Assessment Rating

Risk Rating	Risk Rating Scores	Indicative Management Option
Very High	17 – 25	Manage by implementing site management and emergency procedures, plant design controls and regular monitoring.
High	10 – 16	Manage by implementing site management procedures, specific monitoring and may require some operation/plant design controls.
Medium	5 – 9	Manage by implementing specific monitoring or response procedures.
Low	1 – 4	Manage by routine procedures, unlikely to need specific application of resources.

3.2 Environmental Risk Assessment

Activities associated with the ERAs which have the potential to cause environmental harm and/or nuisance and the potential impacts have been identified and tabulated. The inherent risk of the impacts occurring, and the residual risk following the implementation of management strategies, has then been assessed. Refer to Table 6 – Identification of Potential Impacts and Risks for the assessment.

Table 6 – Identification of Potential Impacts and Risks

Environmental Aspect	Potential Environmental Impact	Source Activity	Inherent Risk Rating [a]	Evaluation and Risk Treatment	Residual Risk Rating [b]
Table notes: (a) **"Inherent risk" is the level of risk that exists if the impacts go unmitigated.** (b) **"Residual risk" is the risk** that remains after implementation of the proposed control / management measures.					
Air	Emission of dust to air impacting nearby sensitive receptors.	• Clearing of vegetation and topsoil / overburden ahead of the extraction activity. • Stockpiling of topsoil and overburden. • Extraction and handling of raw materials (e.g., transfer of materials, processing, blending, stockpiling, transportation). • Vehicle movements on unsealed roads and access tracks.	2 x 3 = 6 (Medium)	In the absence of control measures, potential incidents associated with air emissions impacting nearby sensitive receptors is scored medium due to the setting of the site a very rural locality with limited nearby receptors. The Air Quality Management Plan (refer to Section 4.1 – Air Quality Management Plan) has been developed to manage the potential impacts to air from the site activities. Residual risk is reduced to a lower level as the likelihood of an incident occurring is reduced through the implementation of the EMP. Provided Rockhampton Sands implement the measures outlined in the EMP and comply with the requirements of the EA conditions, the residual risk score is reduced, based on a reduced likelihood of impacts.	2 x 2 = 4 (Low)

Environmental Aspect	Potential Environmental Impact	Source Activity	Inherent Risk Rating [a]	Evaluation and Risk Treatment	Residual Risk Rating [b]
Table notes: (a) **"Inherent risk" is the level of risk that exists if the impacts go unmitigated.** (b) **"Residual risk" is the risk** that remains after implementation of the proposed control / management measures.					
Water	Release of contaminated water to the receiving environment.	• Clearing of vegetation and topsoil / overburden ahead of the extraction activity. • Stockpiling of topsoil and overburden. • Extraction and handling of raw materials (e.g., transfer of materials, processing, blending, stockpiling, transportation).	4 x 3 = 12 (High)	Stormwater runoff will interact with disturbed areas created through the development of the proposed extraction areas. In addition, the site is in a known floodplain area subject to inundation during regional flood events. Inherent risk of impacts to off-site waters is conservatively scored high in the absence of any environmental controls to mitigate risks. The site is currently encompassed by a perimeter bund and has been constructed to 1% Annual Exceedance Probability (AEP) to restrict surface water flows onto the site. All surface water contained within the perimeter bund of the site will be collected and re-used in the extraction process. No water will be discharged from the site. Section 4.2 – Water Quality Management Plan has been developed to mitigate the potential impacts to water as a result of the site activities. Provided the measures outlined in the EMP are implemented, and the EA conditions are complied with, the environmental outcomes of the EA are likely to be achieved. Residual risk is reduced to a lower level as the likelihood of an incident occurring is reduced through the implementation of the management measures nominated in the EMP. The consequence remains the same, which results in a residual risk rating of medium. A medium residual risk requires ongoing implementation of specific monitoring or response procedures. These are documented in Section 4.2.	3 x 2 = 6 (Medium)

Environmental Aspect	Potential Environmental Impact	Source Activity	Inherent Risk Rating [a]	Evaluation and Risk Treatment	Residual Risk Rating [b]
Table notes: (a) **"Inherent risk" is the level of risk that exists if the impacts go unmitigated.** (b) **"Residual risk" is the risk** that remains after implementation of the proposed control / management measures.					
Water	Disturbance of Potential or Actual Acid Sulfate Soil ('ASS') materials resulting in impacts to the receiving environment.	• Extraction of raw materials.	3 x 3 = 9 (Medium)	A preliminary ASS investigation was undertaken in 2010 as part of initial site investigation to support the original development application for the extractive industry. The results of the investigation determined a very low potential for ASS presence across the site, with only three (3) samples of the 57 samples tested indicating the presence of Potential ASS ('PASS'), primarily within the northeast corner of the site. In the event that any PASS is detected during the extraction activities, methods for management and monitoring of the materials are provided in Section 4.3 – Acid Sulfate Soil Management Plan. Provided Rockhampton Sands implement the EMP, potential for impacts to the receiving environment through disturbance of ASS/PASS will be reduced, and the residual risk is reduced to a lower score based on a decreased likelihood of an impact event occurring. The risk remains medium, which will require ongoing management through the implementation of the EMP.	2 x 3 = 6 (Medium)
Groundwater	Impacts to groundwater levels and or quality.	• Extraction of raw materials. • Storage and handling of hydrocarbons and chemicals (i.e., fuels, lubricants, herbicides and other chemicals).	3 x 3 = 9 (Medium)	Based on drill hole data for the site reported in the historical resource investigation, groundwater levels across the site varied between 5 m below ground surface, and 6.7 m below natural ground surface. Groundwater levels have been monitored at the site in two existing groundwater bores (BH2 and BH3), demonstrating that groundwater levels have remained relatively consistent with those identified during the resource investigation. Section 4.2 includes measures for capture and treatment of surface waters that may interact with potential contaminants at the site that could impact groundwater. In addition, Section 4.2 includes provisions for the ongoing monitoring of groundwater in accordance with the Groundwater Monitoring Program (Groundwork Plus 2021), to ensure that any fluctuations in groundwater level or quality that require management are identified and actioned. The EMP also includes a Hydrocarbon and Chemical Management Plan that provides measures for management of	3 x 2 = 6 (Medium)

Environmental Aspect	Potential Environmental Impact	Source Activity	Inherent Risk Rating [a]	Evaluation and Risk Treatment	Residual Risk Rating [b]
Table notes: (a) **"Inherent risk" is the level of risk that exists if the impacts go unmitigated.** (b) **"Residual risk" is the risk** that remains after implementation of the proposed control / management measures.					
				other potential contaminants, refer to Section 4.3 – Hydrocarbon and Chemical Management Plan for details. To monitor impacts from the site activities, one additional bore (BH05) is proposed to be installed on the western and northern boundary of Lot 250 respectively. Ongoing monitoring of groundwater will be carried out to ensure that any trends are observed, and actions taken in the event the review of monitoring data indicates that additional groundwater management measures are needed. All monitoring is to occur in accordance with the Groundwater Monitoring Program (Groundwork Plus 2021). Provided Rockhampton Sands implement the EMP, potential for impacts to groundwater will be reduced, and the residual risk is reduced to a lower score based on a decreased likelihood of an impact event occurring, However, the risk remains medium, which will require ongoing management through the implementation of the EMP.	
Noise	Noise nuisance for nearby noise sensitive receptors.	• Clearing of vegetation and topsoil / overburden ahead of the extraction activity. • Stripping and stockpiling of topsoil, subsoils and overburden. • Extraction and handling of materials (e.g. transfer of materials, stockpiling, transportation). • Screening and processing of the materials.	3 x 2 = 6 (Medium)	In the absence of any noise management measures, the site activities have the potential to influence the noise EVs of the locality. Due to the rural site setting, the inherent risk of potential noise nuisance is scored medium. The Noise Management Plan (refer to Section 4.4 – Noise Management Plan) has been developed to manage the potential impacts from noise at the site activities. Residual risk is reduced to a lower level as the likelihood of an incident occurring is reduced through the implementation of the EMP. Provided Rockhampton Sands implement the measures outlined in the EMP, and comply with the requirements of the EA conditions, the residual risk score is reduced to low based on a reduced likelihood of impacts.	2 x 2 = 4 (Low)

Environmental Aspect	Potential Environmental Impact	Source Activity	Inherent Risk Rating [a]	Evaluation and Risk Treatment	Residual Risk Rating [b]
Table notes: (a) **"Inherent risk" is the level of risk that exists if the impacts go unmitigated.** (b) **"Residual risk" is the risk** that remains after implementation of the proposed control / management measures.					
		• Vehicle movements on unsealed roads and access tracks. • Plant and equipment use, including reverse beepers. • Radio / UHF use and • Alarms.			
Waste	Improper disposal of wastes (general and regulated waste).	Storage and disposal of residual waste (i.e., general and regulated waste).	3 x 4 = 12 (High)	The type of wastes that may be generated at the quarry include, but are not necessarily limited to, the following: • Regulated wastes (e.g. batteries, oil filters, waste oil/hydrocarbons and containers, oil/water emulsions and tyres). • Scrap metal and used or faulty parts and equipment. • General waste such as food waste, packaging and consumables. • Green waste. The Waste Management Plan included as Section 4.5 – Waste Management Plan details measures for management of waste at the site, with reference to the requirements of the *Waste Reduction and Recycling Act 2011* (WRR Act).	2 x 3 = 6 (Medium)
Land	Release hydrocarbons and fuels to land.	Storage and handling of chemicals and fuels on-site.	4 x 4 = 16 (High)	The inherent risk of handling fuels and chemicals is high due to an increased likelihood of potential release if handling and storage activities are unmanaged. Section 4.3 – Hydrocarbon and Chemical Management Plan provides management measures for handling and storage of hydrocarbons and chemicals to reduce the potential impacts to land associated with spills and/or leaks. Provided Rockhampton Sands implements the measures outlined in the EMP, the residual risk is reduced to a lower level as the likelihood and	2 x 3 = 6 (Medium)

Environmental Aspect	Potential Environmental Impact	Source Activity	Inherent Risk Rating [a]	Evaluation and Risk Treatment	Residual Risk Rating [b]
Table notes: (a) **"Inherent risk" is the level of risk that exists if the impacts go unmitigated.** (b) **"Residual risk" is the risk** that remains after implementation of the proposed control / management measures.					
				consequence of an incident occurring is reduced through the implementation of the management measures outlined in the EMP. The residual risk is scored medium, which will require ongoing management in accordance with the EMP will be required to ensure risk is as low as reasonably possible.	
	Post-closure implementation and management of the site rehabilitation.	Failure of the operator to undertake rehabilitation of the disturbance area at the cessation of the activities.	3 x 4 = 12 (High)	Section 4.6 – Rehabilitation Management Plan outlines general rehabilitation requirements for the site. The life of the operation is anticipated to extend into the foreseeable future; therefore, a more detailed rehabilitation and closure plan should be prepared prior to cessation of the extractive industry use of the site to reflect a land use relevant to the planning scheme in place at the time. Residual risk is reduced to a lower level as the likelihood of failure of progressive and/or final rehabilitated landforms is reduced through the implementation of the EMP and compliance with the EA conditions. With future planning and implementation of successful rehabilitation, the likelihood of failure is reduced; however, the consequence remains the same, which result in a residual risk rating of medium.	2 x 3 = 6 (Medium)

4. Environmental Management Plans

4.1 Air Quality Management Plan

Objective

The activity will be operated in a way that protects the environmental values of air.

Purpose

This Air Quality Management Plan has been prepared to control potential air quality impacts occurring as a result of land disturbance necessary for the site operations. The *Environmental Protection Act 1994* and the associated *Environmental Protection (Air) Policy 2019* provide the legislation and regulatory controls for management of emissions to the atmosphere.

Performance Targets

- No environmental nuisance complaints in relation to air quality impacts (i.e., unmitigated emissions of dust, odours or light) associated with the site activities.
- Dust and particulate matter emissions generated by the activities must not cause exceedances of Dust and particulate matter not exceeding the levels shown in Table 7 – Air Quality Parameters when measured at the sensitive receptor.

Table 7 – Air Quality Parameters

Contaminant	Measure	Target Upper Limit
Dust Deposition	Deposition rate	120 $mg/m^2/day$
PM_{10}	Concentration	50 $\mu g/m^3$ averaged over 24 hours

Management Strategies

General
- Ensure sufficient on-site water supply is available for dust suppression.
- Apply good housekeeping practices.
- Continued use of dredge for 'wet extraction' to limit dust output from operation.

Work Areas / Trafficable Areas
- Limit high dust generating activities (e.g., removal of topsoil/overburden) to periods of favourable weather conditions.
- Dampen down (approx. rate of 2 litres/m^2/hour) work areas, stockpiles, access roads and other hardstand areas by water spraying when visual surveillance indicates excessive dust generation.
- Restrict vehicle movements to designated routes to the extent practicable.
- Enforce speed limits on internal roads.
- Pave and/or seal high trafficable access roads and/or tracks, where practicable.
- Maintain road surfaces in good condition.
- Prevent and clean up any raw material / product spillages or dust accumulation on driveways or sealed roads.

Processing Plant
- Use water sprays and/or dust collection systems at transfer points.
- Use shielding and/or windbreaks where possible.
- Maintain equipment in accordance with the original equipment manufacturers' specifications.

Stockpiles
- Limit the height of any stockpiles to <6m, where practicable.
- Regularly water sand and aggregate stockpiles to keep down dust emissions.
- Apply additional water sprays to stockpiles during high wind conditions.

Transport of Materials
- Ensure that incoming and outgoing truckloads of materials are covered during transport.

4.1	Air Quality Management Plan
	• Ensure that truck bodies and trailers leaving the premises are clean, focusing on draw bars and tail gates, to prevent material spillages causing dust nuisance and being tracked onto external roads.
Monitoring	Daily visual surveillance must be undertaken by all employees to ensure dust generation on-site is controlled appropriately. Dust and particulate monitoring must be undertaken at the request of the administering authority in accordance with the relevant conditions of the EA. Dust and particulate monitoring must be undertaken to investigate any complaint of environmental nuisance caused by dust and/or particulate matter. When requested to undertake monitoring, monitoring results are to be provided to the administering authority following completion of the monitoring event. Monitoring shall be carried out at a place(s) relevant to the potentially affected dust sensitive place and must include: • for a complaint alleging dust nuisance, dust deposition. • for a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere over a 24hr averaging time. The monitoring must determine the extent to which the air quality achieves the performance targets specified in Table 7 – Air Quality Parameters. Methods of monitoring for the specified parameters are as follows: <u>Dust Deposition</u> • *Australian Standard (AS) 3580.10.1 Methods for sampling and analysis of ambient air – Determination of particulates – Deposited matter – Gravimetric method* (Standards Australia 2016). <u>PM_{10}</u> • *AS 3580.9.6 Determination of Suspended Particulate Matter-PM10 High Volume Sampler with Size Selective Inlet-Gravimetric Method* (Standards Australia 2015). • *AS 3580.9.9 Methods for sampling and analysis of ambient air Determination of suspended particulate matter – PM_{10} low volume sampler– Gravimetric method* (Standards Australia 2017). • Any alternative method of monitoring PM_{10} which may be permitted by the Air Quality Sampling Manual as published from time to time by the administering authority. The monitoring results must be provided within 10 business days to the administering authority upon its request.
Contingency Plan	Any complaint received in relation to dust impacts is to be managed by the Operations Manager in accordance with Section 2.3 - Complaint Recording and Response. Any exceedance of the approved limits is to be reported to the administering authority in accordance with Section 2.4 – Incident Response Procedure, and corrective action is to be identified and undertaken in consultation with the administering authority. In the event that air quality monitoring (dust and/or particulate matter) determines an exceedance of the approved limits (noted under *Performance Targets*), the Operations Manager may engage the services of a suitably qualified person to determine additional management strategies to mitigate impacts. Additional air quality monitoring should be undertaken as necessary to determine the effectiveness of any additional management strategies employed in response to exceedance of approved limits.

4.2 Water Quality Management Plan

Objective	The activity will be operated in a way that protects the environmental values of water. The activity will be operated in a way that protects the environmental values of groundwater and any associated surface ecological systems.
Purpose	This Water Quality Management Plan has been prepared to control potential environmental impacts occurring as a result of land disturbance necessary for the site operation.
Performance Targets	• To ensure all prescribed water contaminants (Schedule 10 EP Reg) including sand, suspended solids, turbid waters, chemicals, lubricants, or fuels are not released from the site. • Stormwater runoff from disturbed areas of the site must be retained on site and re-used in the extractive industry operations. • No actual or potential adverse effect on groundwater from the operation of the activity.

Management Strategies	<u>Sediment Basins</u>
	
	• All process water used during processing of the materials, and waters flowing over disturbed areas, must be diverted to on-site basins and/or the extraction void.
	• Sediment basins (except the extraction void) must be designed to capture sediment up to a depth of 0.5 m within the base. An indicator marker is to be installed at the base to identify the level of sediment accumulated.
	• Sediment is to be removed to return the sediment basins to full capacity on a periodic basis or when the sediment level is approaching the sediment storage capacity. This material is to be excavated and managed in line with the management measures detailed in Erosion and Sediment Control (section below).
	• Sediment must not be disposed of in a manner that will create an erosion or pollution hazard.
	• Sediment basins are to be inspected during the following periods:
	  o Quarterly as a minimum.
	  o After each rain event, particularly focusing on the entry and exit points, if damage has occurred then make necessary repairs.
	  o Prior to or immediately after periods of sustained shut down (i.e., greater than 30 days).
	
	<u>Erosion and Sediment Control (‘ESC’)</u>
	
	<u>Site Management</u>
	• Allow stormwater to pass through the site in a controlled manner and at non-erosive flow velocities up to the specified design storm discharge.
	• Minimise soil erosion resulting from rain, water flow and/or wind.
	• Minimise adverse effects of sediment runoff, including safety issues.
	• Prevent, or at least minimise, environmental harm resulting from work-related soil erosion and sediment runoff.
	• Ensure that use of land/properties adjacent to the development are not diminished as a result of the adopted ESC measures.
	
	<u>Land Clearing</u>
	• Prior to land clearing, areas of protected vegetation, and significant areas of retained vegetation must be clearly identified for the purposes of minimising the risk of unnecessary land clearing.
	• All reasonable and practicable measures must be taken to minimise the removal of, or disturbance to, those trees, shrubs and ground covers (organic or inorganic) that are intended to be retained.
	• All land clearing must be undertaken in accordance with the Development Approval and applicable legislation.

4.2 Water Quality Management Plan

- Land clearing is limited to the minimum practicable extent during those periods when soil erosion due to wind, rain or surface water is possible.

Site Access
- Site exit points must be appropriately managed to minimise the risk of sediment being tracked onto sealed, public roadways.

Stockpile Management
- Adequately protect stockpiles from wind, rain, concentrated surface flow and excessive upslope stormwater surface flows.
- Located at least 5 m from any hazardous area, retained vegetation or concentrated drainage line.
- Located up-slope of an appropriate sediment control system.
- A suitable flow diversion system must be established immediately up-slope of a stockpile.
- Prior to wet season (generally from December to March) overburden / soil stockpiles should be revegetated with temporary groundcover and/or located out of concentrated stormwater flow paths.

Drainage Control
- Wherever reasonable and practicable, stormwater runoff entering the site from external areas, and non-sediment laden (clean) stormwater runoff entering a work area or area of soil disturbance, must be diverted around or through that area in a manner that minimises soil erosion and the contamination of that water for all discharges up to the specified design storm discharge.
- All reasonable and practicable measures must be implemented to control flow velocities in such a manner than prevents soil erosion along drainage paths and at the entrance and exit
- Wherever reasonable and practicable, “clean” surface waters must be diverted away from sediment control devices and any untreated, sediment-laden waters.
- The internal drainage channel is to be constructed with silt traps. Any silt traps are to be cleared at regular intervals.
- The site is encompassed by a perimeter bund which restricts overland flow water from entering and exiting the site.

Sediment Control
- Efforts are to be employed to trap sediment within the site, and as close as practicable to its source.
- Sediment traps must be installed and operated to both collect and retain sediment.
- The potential safety risk of proposed sediment control devices to site workers, visitors and the public must be given appropriate consideration, especially those devices located within commonly accessible areas.
- All reasonable and practicable measures must be taken to prevent, or at least minimise, the release of sediment from the site.
- Suitable all-weather maintenance access must be provided to all sediment control devices.
- Sediment control devices must be de-silted and made fully operational as soon as reasonable and practicable after a sediment-producing event, whether natural or artificial, if the device’s sediment retention capacity falls below 75% of its retention capacity.
- Materials, whether liquid or solid, removed from sediment control devices during maintenance or decommissioning, must be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.

Site Maintenance
- All erosion and sediment control measures, including drainage control measures, must be maintained in proper working order at all times during their operational lives.
- Sediment removed from sediment traps and places of sediment deposition must be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

Groundwater

4.2 Water Quality Management Plan

	Groundwater is to be monitored at the site to determine if specific management measures are required. Refer to 'Monitoring' for details.
Monitoring	<u>Visual Inspections</u> A summary schedule of the various inspections, performance criteria and responses that are to be performed on site is shown in Table 8 – Inspection and Maintenance of Stormwater Control Devices. <u>Water Quality Monitoring</u> • Water quality monitoring must be in accordance with the methods prescribed in the current edition of the administering authority's *Monitoring and Sampling Manual* (DES 2018). • Water and sediment samples must be representative of the general condition of the water body or sediments. • All determinations must employ analytical practical quantification limits of sufficient sensitivity to enable comparisons to be made against water quality objectives/triggers/limits relevant to the particular water or sediment quality characteristic. • All monitoring devices must be calibrated and maintained according to the manufacturer's instruction manual. <u>Groundwater Monitoring</u> Groundwater monitoring is to be carried out at the site in accordance with Attachment 2 – Groundwater Monitoring Program. The monitoring is to assess the Groundwater Level, pH; and Electrical Conductivity (EC) to identify any trends or fluctuations which may require remedial action to be implemented.
Contingency Plan	Non-compliances may be identified by the visual inspection and through water quality monitoring. After any identification of incident or failure, the source/cause is to be immediately located and the following measures implemented (IECA (Australasia) n.d.): • Severe or excessive rill erosion – investigate cause, control up-slope water movement, re-profile surface, cover dispersive soils with a minimum 100 mm layer of non-dispersive soil, and stabilise with erosion control measures and vegetation as necessary. • Poor vegetation growth or soil coverage – plant new vegetation and/or mulch as required. • Sediment control failure – replace and monitor more frequently. Regular failures may mean that the sediment control location, alignment or installation may need to be amended. • Scour / erosion of bunds will be required to be stabilised. In the event that groundwater monitoring identifies a significant variation from baseline groundwater quality or levels, a suitably qualified person is to be engaged to determine additional management measures to be applied. If a discharge of contaminants occurs to water or groundwater as a result of on-site operations, the administering authority must be notified, and an investigation conducted to identify appropriate action to resolve the issue to the fullest practicable extent. Refer to Section 2.4 – Incident Response Procedure of this EMP for details regarding reporting of incidents.

Table 8 – Inspection and Maintenance of Stormwater Control Devices

Inspection	Minimum Frequency	Performance Criteria	Response
Drainage lines including catch drains, contour drains and diversions.	Quarterly, and prior to and following rainfall events.	• Erosion in areas adjacent to water conveyancing structures.	• Eroded areas are to be rip rapped as soon as practicable.
		• Overtopping of water conveyancing structures (identified by the scouring of the drain batters perpendicular to the direction of flow).	• The drain is to be cleaned of sediments and rip rap replaced to the original design specifications. • Rehabilitation with grasses in the catchment of the drain may be required to reduce sediment loadings of runoff.
Potential sediment storage capacity of grit traps, sediment traps and water storage areas.	Quarterly or following major rainfall events.	• Storage capacity maintained at >75%.	• Sediment/grit is to be removed from the structure.
			• Recycle excavation pit water to ensure that adequate free storage is maintained for the collection and holding of runoff.
Waste containers.	Quarterly.	• Waste is stored in appropriate containers. • Waste receptacles labelled.	• Ensure waste material is stored and disposed of properly.
Spill response stations.	Quarterly and following use.	• Equipment is properly maintained.	• Maintain equipment. • Replace used equipment.
Maintenance / refuelling area.	Quarterly.	• Fuel, oil spills.	• Clean up fuel spills and investigate source.
		• Contractor maintenance.	• Maintain contractor maintenance records.

4.3 Acid Sulfate Soil Management Plan

Objective	The activity will be operated in a way that protects the environmental values of water and land.
Purpose	A preliminary Acid Sulfate Soil ('ASS') investigation was undertaken in 2010 as part of initial site investigation to support the original development application for the extractive industry. The results of the investigation determined a very low potential for ASS presence across the site, with only three (3) samples of the 57 samples tested indicating the presence of Potential ASS ('PASS'), primarily within the northeast corner of the site. This Acid Sulfate Soil Management Plan has been prepared to control potential environmental impacts occurring in the event of disturbance of PASS / ASS during the site operation.
Performance Targets	No actual or potential adverse effect on water or wetlands in the event of ASS disturbance during the site operations.
Management Strategies	<u>Staff Awareness</u> • Staff are to be made aware of the potential presence of PASS. It is important to be able to recognise indicators of actual ASS to prevent further acidification of land and waterways. These indicators include: o cloudy green-blue water o excessively clear water o iron stains o poor pasture o scalded soil o yellow jarosite o 'rotten egg' smell o waterlogged soil o corrosion of concrete and/or steel structures o oily-looking surface iron bacterial scum o dark grey soils. <u>During Extraction</u> • Regular surveillance during earthworks to detect PASS/ASS should be undertaken. • Where PASS is suspected, regular sampling during extraction should be undertaken for pH_f / pH_{fox} by NATA accredited laboratory. • If field test results indicate that PASS / ASS may be present, then undertake SPOCAS (Suspension Peroxide Oxidation Combined Acidity and Sulphur) and Chromium testing is to be undertaken to confirm PASS / ASS and to calculate the applicable liming rate. <u>Treatment Area</u> • Where ASS or PASS materials are identified, a designated treatment area within the stockpile area is to be prepared. • The base of the treatment pad is to be graded such that all surface water flows to one or multiple collection sumps. • Appropriate sedimentation controls are to be constructed around each collection sump. • The base of the treatment pad will be constructed with a low permeable base. The pads are to have a guard layer of agricultural lime applied at a minimal rate of 5 kg/m^2 or 0.2, multiplied by the average of potential and existing acidity per metre depth of material to be treated. • A bund wall is to be constructed surrounding the treatment pad such the storm water flow outside the treatment pad is restricted from flowing into the treatment pad and storm water within the treatment pad is restricted from flowing beyond the collection sump/s.

4.3 Acid Sulfate Soil Management Plan

Neutralising Agent

Fine high quality agricultural lime is recommended as the neutralising agent, with the acid neutralising value (ANV) a minimum of 97% $CaCO^3$. If lower quality lime is used the quantity must be increased accordingly, based on purity analysis data for the lime source. AgLime is non-corrosive and requires no special handling. Other alternative neutralising agents such as dolomite may be used but these must be approved by an appropriately qualified person

Stockpiling

- Suspected or confirmed ASS material is to be stockpiled at the designated stockpile area within a bunded area.
- Once stockpiled, the material is to be tested to verify the ASS and liming rate requirements.
- Excavated ASS must be limed as soon as practicable.
- If excavated ASS needs to be stockpiled before placement into treatment areas, the maximum timeframe specified in Table 9 – ASS Material Stockpiling Timeframes are to be adhered to.

Table 9 – ASS Material Stockpiling Timeframes

Soil Type	~ Clay Content	Duration of Stockpiling
Sand to slight clayey Sand	<5%	Overnight / max. 24 hrs.
Sandy loams to light clays	5 – 40 % clay	2.5 days / max. 70 hrs
Medium to heavy and / or silty clays	>40% clay	5 days / max. 140 hrs.

Stormwater

- Stormwater interacting with confirmed ASS is to be retained on site and managed prior to release.
- Waters are to be tested and treated to an appropriate limit prior to discharge as stormwater.

Validation

- Following treatment, soils are to be re-tested to confirm they have been successfully neutralised.

Monitoring

Regular visual surveillance to detect PASS/ASS is to be undertaken to identify signs of ASS oxidation. This monitoring should include detecting:

- Unexplained scalding, degradation or death of surrounding vegetation.
- Formation of the mineral jarosite and other acidic salts in exposed or excavated soils.
- Areas of green-blue water or extremely clear water indicating high concentrations of aluminium.
- Rust coloured deposits on plants and on the banks of drains, water bodies and watercourses indicating iron precipitates.
- Black to very dark coloured waters indicating de-oxygenation.

While the sand resource is known to be low in acid forming material and therefore a low environmental risk, the following monitoring strategy can be applied in the event PASS or ASS is suspected:

(a) Analysis for screening tests for pH via pH_f and pH_{fox} must be conducted at the rate of one sample per 2,000m^3.
(b) If, following five (5) consecutive samples, where pH_{fox} is >3.5, analysis for pH_f and pH_{fox} is to be undertaken at a rate of one sample per 10,000 m^3.
(c) Where sampling determines pH_{fox} <3.5 sampling must revert to one sample per 1000m^3 until five (5) consecutive samples of pH_{fox} >3.5 is determined. If pH_{fox} is <3.5, SPOCAS or Chromium suite analysis must be undertaken.
(d) As well as the results of pH ASS screening analysis, SPOCAS or Chromium test must be undertaken at one test per 10,000m^3.

4.3	Acid Sulfate Soil Management Plan
	(e) If SPOCAS/Chromium tests indicate acidity level is less than the action criteria consecutively for five (5) lots (50,000 m^3), SPOCAS/Chromium tests to then be performed at one (1) sample per 30,000 m^3. (f) If (a) above shows pH_{fox} is <3.5 or the test per 30,000 m^3 exceed action criteria, the frequency of pH analysis reverts back to one (1) test per 10,000 m^3. The laboratory analysis to be used will be in accordance with the relevant Queensland Acid Sulfate Soil Investigation Team (QASSIT) ASS Laboratory Guideline methods. The validation testing is to be conducted by an experienced and suitably qualified professional.
Contingency Plan	In the event that the neutralisation has not been successful, retesting and treatment of the material may be required, which will include the following: • Retesting of materials in vicinity of excavation using approved method. • Assessment of need for additional lime then application with thorough mixing and re-validation. In the event of a release of contaminants (e.g., acidic waters) from the site, the incident must be notified to DES, refer to Section 2.4 - Incident Response Procedure. Where an incident occurs, a suitably qualified person is to be engaged to provide advice on additional management measures for any ASS/PASS materials.

4.4 Hydrocarbons and Chemical Management Plan

Objective	The activity is operated in a way that protects the environmental values of land, air and water including soils, subsoils, landforms and associated flora and fauna.
Purpose	The Hydrocarbons and Chemicals Management Plan has been prepared to control the potential for spills or leaks from chemicals and hydrocarbons associated with the site activities.
Performance Targets	• No land contamination from the site activity that would require registration on the Contaminated Land Register (CLR). • No serious spills of oils, greases, fuels, or other hazardous chemicals. • No preventable release of hydrocarbons and chemicals to the environment.
Management Strategies	General • Any chemical handling and storage must be designed and installed in accordance with the most recent edition of *AS 1940 - The storage and handling of flammable and combustible liquids* (Standards Australia 2017), as a minimum. • Safety Data Sheets (SDS) of chemicals used on site shall be kept in a register at the site office. • Spills are to be cleaned up immediately with appropriate spill kits. Spillages must not be cleaned up in a way that releases wastes, contaminants or other materials to any stormwater drainage systems, roadside gutters or waters. • All new employees are to be inducted on the use of handling of chemicals used on-site. Spill Kits • Maintain appropriate spill kits and personal protective equipment at locations known to all employees (e.g., refuelling locations, mobile equipment). • Ensure employees are familiar with, and trained in, the use of proper spill clean-up procedures and always maintain a copy of the procedures at the site. • Undertake regular spill kit inventory checks to ensure sufficient materials and supplies are available in the event of a spill. Disposal • Hydrocarbon contaminated materials are to be appropriately disposed of at a licensed facility. • If the material is a Regulated Waste (as defined under the legislation) it must be transported and disposed of by a licensed contractor. • Oily waste materials, including liquid hydrocarbons, should be segregated from general wastes for disposal off-site by a licensed contractor. • Records are to be kept on disposal of waste for all regulated waste materials.
Monitoring	Areas where handling of hydrocarbons and chemicals occur (e.g., refuelling or minor on-site servicing) shall be regularly inspected by the Operations Manager. All employees will be responsible for the safe day to day handling, use and temporary storage of chemicals being used on-site.
Contingency Plan	In the event of any spill, implement the steps outlined in Diagram 3 – Spill Response Procedure. Remediation of land contamination may be required in the event of more serious incidents; however, Rockhampton Sands is to consult with a suitably qualified person to determine the nature and extent of any contamination remediation process.

Diagram 3 – Spill Response Procedure

4.5 Noise Management Plan

Objective

The activity will be operated in a way that protects the environmental values of the acoustic environment.

Purpose

This Noise Management Plan has been prepared to control potential nuisance impacts that may occur as a result of noise associated with the site operations.

Performance Targets

- No environmental nuisance complaints relating to the site operations.
- Noise at the site must not exceed the noise limits specified in the EA, extracted as Table 10 – Noise Limits.

Table 10 – Noise Limits

Noise level dB(A) measured as	Monday to Saturday	Sunday
	6am to 6pm	6am to 6pm
$L_{A90,\ adj,\ 15mins}$	Lesser of bg+3 or 48	Lesser of bg+3 or 48
$L_{A90,\ adj,\ 15mins}$	Lesser of bg+5 or 50	Lesser of bg+5 or 50
$L_{A90,\ adj,\ 15mins}$	Lesser of bg+10 or 55	Lesser of bg+10 or 55

Table notes:
bg = background noise level, LA90, 15 mins.
In the event that measured bg is less than 25 dB(A), then 25 dB(A) is to be used.
The noise levels specified are measured outdoors in the free field at a location at least 4m from the external façade of a building at the nuisance sensitive place.
Measured levels include background plus the activity.

Management Strategies

- Hours of operation are to be:
  - 6:00am to 6:00pm Monday to Saturday; and,
  - No operations on Sundays or public holidays.
- Mobile plant (e.g., front-end loaders, dozers, haul trucks, excavators) are to be fitted with broadband reversing alarms where possible to mitigate potential nuisance from tonal characteristics.
- Stockpile areas should be designed to allow forward-in, forward-out movement of road haulage trucks to avoid a requirement for external trucks to reverse on-site.
- Ensure a site layout that enables product delivery and handling in such a way that reduces the need for reversing.
- Fixed engines, pumps and compressors are to be enclosed where practicable.
- Ensure all site equipment, machinery and vehicles are serviced in accordance with the original equipment manufacturers' specifications as a minimum.
- Ensure all modern mobile plant (e.g., front-end loaders, excavators, off-road trucks) is fitted with effective exhaust silencers.
- Equipment and machinery are to be shut down when not in use.
- Unnecessary revving of mobile or stationary motors and engines is to be avoided.
- Ensure that equipment at the site is used for the intended purpose.
- Ensure that any extraneous noises are rectified.
- Maintain haul roads and hardstand surfaces in good condition (e.g., free of potholes, rills and product spillages) and with suitable grades.
- Avoid the use of compression braking on product delivery trucks entering the site.

Monitoring

The Operations Manager must:

- ensure regular surveillance of the site to qualitatively assess noise generation from the operations.
- initiate a noise survey when requested by the administering authority, or as otherwise deemed necessary, to investigate a noise complaint.

4.5	Noise Management Plan
	Any monitoring must be in accordance with the most recent version of the administering authority's *Noise Measurement Manual* (DES 2020a). When required by the administering authority, noise monitoring must be undertaken, and the results notified within 14 days to the administering authority. Monitoring must include: • $L_{Aeq, adj, T}$ • Background noise (Background) as $L_{A\ 90, adj, T}$ • MaxLpA,T • the level and frequency of occurrence of any impulsive or tonal noise. • atmospheric conditions including wind speed and direction. • effects due to extraneous factors such as traffic noise. • recording of location, date and time of measurements.
Contingency Plan	Any compliant received regarding noise nuisance at a sensitive receptor must be recorded and investigated by the Operations Manager in accordance with Section 2.3 – Complaint Recording and Response. In the event that noise monitoring determines an exceedance of the approved limits, the Operations Manager is to notify the administering authority in accordance with Section 2.4 – Incident Response Procedure. Advice should be sought from a suitably qualified person as to whether additional management measures are required to minimise noise. Additional noise monitoring must be undertaken where necessary to determine the effectiveness of the additional management strategies.

4.6 Waste Management Plan

Objective	Any waste generated, transported, or received as part of carrying out the activity is managed in a way that protects all environmental values.
Purpose	This Waste Management Plan has been prepared with reference to the conditions of approval to ensure wastes produced on-site are appropriately managed. The type of wastes that may be generated at the site may include, but are not necessarily limited to the following: • Regulated wastes (e.g., batteries, oil filters, waste oil/hydrocarbons and containers, oil/water emulsions and tyres). • Scrap metal and used or faulty parts and equipment. • General waste such as food waste, packaging and consumables. • Green waste. The amount of waste generated will fluctuate over the life of the operation, therefore a record of wastes generated must be maintained in an on-site inventory. The *Waste Reduction and Recycling Act 2011* (WRR Act) nominates a waste management hierarchy in a preferred order of adoption. The hierarchy is as follows: *(a) AVOID unnecessary resource consumption* *(b) REDUCE waste generation and disposal* *(c) RE-USE waste resources without further manufacturing* *(d) RECYCLE waste resources to make the same or different products* *(e) RECOVER waste resources, including the recovery of energy* *(f) TREAT waste before disposal, including reducing the hazardous nature of waste* *(g) DISPOSE of waste only if there is no viable alternative.*
Performance Targets	• Implement the WRR Act waste management hierarchy. • Maintain a record of any disposal of trackable wastes in accordance with the EP Reg. • No unlawful disposal of wastes on or off-site.
Management Strategies	<u>Waste Avoidance</u> Waste avoidance relates to preventing the generation of waste or reducing the amount of waste generated. Reasonable and practicable measures for achieving waste avoidance may include, but are not necessarily limited to: • Input substitution (using recyclable materials instead of disposable materials, for example using oil delivered in recyclable steel drums instead of non-recyclable plastic containers). • Increased efficiency in the use of raw materials, energy, water, or land (purchasing consumables in bulk (large containers) rather than in small quantities). • Improved maintenance and operation of equipment (keep equipment in good working order to reduce wear and overhaul). • Undertaking an assessment of waste minimisation opportunities from time to time. <u>Waste Reuse</u> Waste re-use refers to re-using waste, without first substantially changing its form. Reasonable and practicable measures for reusing waste may include, but are not necessarily limited to: • Recovering and separating solvents, metals, oil, or components or contaminants and reusing separated solvents for degreasing plant and equipment.

4.6 Waste Management Plan

- Applying waste processing fines to land in a way that gives agricultural and ecological benefits (using fine sediments in rehabilitation activities).
- Using overburden for constructing bunds and landforming.
- Reusing silt/sediment on-site to the maximum practicable extent.

Waste Recycling

Waste recycling refers to treating waste that is no longer useable in its present form and using it to produce new products. Reasonable and practicable measures may include, but are not necessarily limited to:

- Recovering oils, greases, and lubricants for collection by a licensed oil recycling contractor, recovering, separating, and recycling packaging (including paper, cardboard, steel and recyclable plastics).
- Recycling used plant and equipment to the maximum practicable extent.
- Finding alternatives to disposal of non-recyclable materials (using conveyor belts for noise attenuation, mudflaps, ute tray liners).
- Providing suitable receptacles and storage areas for collection of materials for recycling.

Energy Recovery from Waste

This refers to recovering and using energy generated from waste. Due to the scale of the operation, energy recovery is not considered viable.

Waste Disposal

This refers to disposing of waste which cannot otherwise be reused, recycled or used for energy recovery. Reasonable and practicable measures may include, but are not necessarily limited to:

- Regulated wastes must be transported and disposed of in accordance with the *Environmental Protection Regulation 2019*.
- Disposal to a licensed waste disposal facility (i.e., landfill or transfer station).
- Approved on-site disposal.

Waste Storage

- Waste storage containers or areas are to be provided and located at safe and convenient locations at the site.
- Each container is to be identified with the type of wastes which may be disposed of in each container.
- Each container or area is to be designed to prevent the escape of materials.

Regulated Waste

Regulated Wastes are defined in the EP Reg. Waste management areas must include a dedicated section for regulated wastes, which must be stored within sealed containers within a bunded area in accordance with Australian Standards and the following minimum requirements:

- All regulated wastes will be transported off-site by a suitably licensed commercial transporter with an ERA 57 Regulated Waste Transport (or equivalent) approval.
- To assist in the collection and transfer of regulated wastes, designated regulated waste bins, drums and skips must be used. Where possible these regulated waste storage containers should be located at the work location where the waste is being generated and then returned to the designated regulated waste storage areas for storage prior to offsite disposal or recycling.
- Dedicated regulated waste storage areas must be provided to prevent the mixing of regulated wastes with other stored material or with incompatible hazard classes. Wastes must only be deposited into designated areas within the applicable storage area.
- Storage areas for regulated wastes must be constructed in accordance with AS 1940-2004 or an equivalent Australian Standard.
- An inventory must be kept and maintained of all regulated waste stored.

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- Where possible, regulated waste stores must be lockable to prevent access by unauthorised persons.
- As soon as practicable, remove and dispose of all regulated waste to a licensed waste disposal facility or recycling facility using a licenced contractor.
- Medical wastes must be stored in yellow and black biohazard waste bins. Clinical waste must be bagged in yellow bags with biohazard symbols and stored in rigid-walled, leak-proof secondary containers, in a bunded area with an impervious surface. Clinical waste should be kept in a secure storage area inaccessible to unauthorised people and animals.

Trackable Waste

Certain regulated wastes as defined under Schedule 9 of the EP Reg are to be tracked in accordance with the requirements of Section 11 of the EP Reg. Diagram 4 – Waste Tracking Requirements (Paper Based System) provides an overview of the waste tracking requirements for each stakeholder in the transport and handling of trackable waste chain.

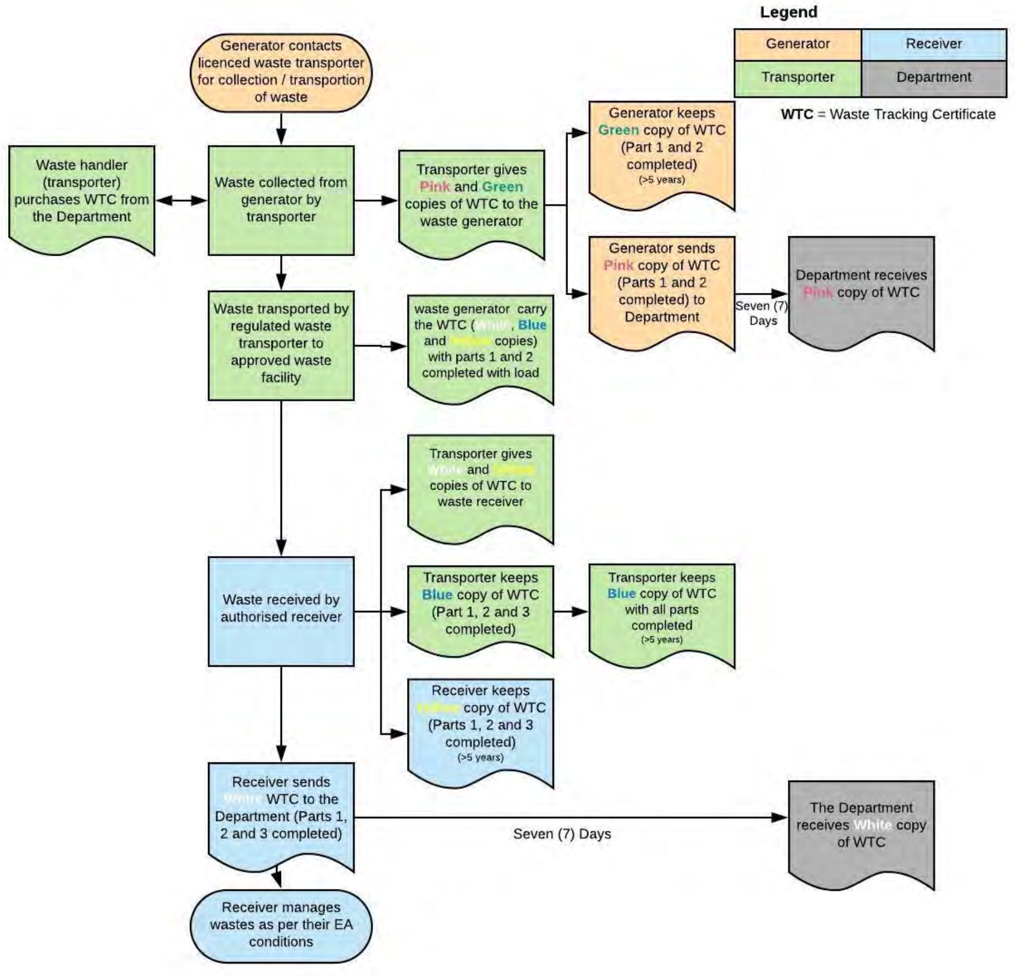

Diagram 4 – Waste Tracking Requirements (Paper Based System)

Monitoring

The Operations Manager must undertake a monthly visual inspection to ensure the waste management hierarchy is being effectively implemented. All site personnel shall be responsible for ensuring wastes are stored and removed from the site on a regular basis (e.g., daily or weekly). The Operations Manager shall ensure that waste treatment measures are implemented at the site.

4.6	Waste Management Plan
	The Operations Manager shall ensure waste receptacles are provided and the waste type identified and that temporary waste storage areas are signed; recycling bins are emptied when full and materials which may cause land contamination are not disposed of on the site. The Operations Manager shall keep a record of regulated waste generated at the site, treatment and disposal methods, approved contractors for transporting and disposing of waste and the location of the facility for accepting the waste.
Contingency Plan	Where a non-compliance is identified, a review of the Waste Management Plan is to be undertaken to determine areas for improvement and additional staff training on waste management procedures and waste handling is to be undertaken. Where Rockhampton Sands becomes aware that any wastes have been inappropriately disposed of, the incident must be notified to the administering authority in accordance with Section 2.4 – Incident Response Procedure. If a release of contaminants occurs as a result of on-site operations and it is likely to cause serious or material environmental harm, the administering authority must be notified, and an investigation conducted to identify appropriate action to resolve the issue to the fullest practicable extent.

4.7 Rehabilitation Management Plan

Objective	The activity is operated in a way that protects the environmental values of land including soils, subsoils, landforms and associated flora and fauna.
Purpose	This Rehabilitation Management Plan has been prepared to assist with site rehabilitation.
Performance Outcomes	• Limit land disturbance to that which is necessary at any one time. • Identify any land contamination and implement appropriate remediation or management where necessary. • Land that has been disturbed for activities must be rehabilitated in a manner such that: o suitable native species of vegetation for the location are established and sustained for earthen surfaces. o potential for erosion is minimised. o the quality of water released from the site, including seepage, does not cause environmental harm. o potential for environmental nuisance caused by dust is minimised. o the water quality of any residual water body does not have potential to cause environmental harm. o the final landform is stable and protects public safety. • Rehabilitation of disturbed areas must take place progressively as works are staged and new extraction areas are commenced.
Strategies	<u>Post Quarry Land Use and Final Landform Design</u> The post-quarrying land use of the site is to demonstrate consideration for the zoning of the land and surrounding undisturbed areas. The site has been historically used for grazing purposes and is currently zoned as Rural zone under the *Rockhampton Region Planning Scheme 2015*. Council defines the purpose of the rural zone as follows: *The purposes of the rural zone code is to:* *a) ensure that land with productive capacity is maintained for a range of existing and emerging rural uses that are significant to the economy of the planning scheme area;* *b) recognise that different types of rural land are suited to specific uses such as animal industries, horticulture, cropping, intensive animal industries, intensive grazing and extractive industries;* *c) prevent the establishment of development which may limit the productive capacity of the land;* *d) provide for diversification of rural industries where impacts can be managed; and* *e) maintain the environmental values of all rural land.* As a result, the rehabilitation is to return the site to a system that can support a grazing use. Several water bodies are likely to be incorporated into the final landform for ongoing beneficial use by the landowner for water storages (e.g., livestock drinking water supply). The Key Performance Indicators (KPIs) summarised in Table 11 – Key Performance Indicators for Rehabilitation have been established to provide quantifiable measures for achieving the performance targets for rehabilitation. Each of the KPIs are assigned to Rockhampton Sands for completion; however, should the Rockhampton Sands require assistance to measure the achievement of these KPIs, they may engage a suitably qualified person. <u>Progressive Rehabilitation</u> Rehabilitation is to be undertaken progressively throughout the life of the operations and is to commence in each area as soon as practicable (but no later than six months) after it is no longer required for operational purposes. Progressive rehabilitation will be deemed complete when the Key Performance Indicators are achieved (refer to Table 11 – Key Performance Indicators for Rehabilitation).

4.7 Rehabilitation Management Plan

Topsoil and Subsoil Management

The site lies within the Fitzroy River flood plain, which is responsible for the creation of the sand deposit. The changing course of the river and the numerous flooding events has resulted in the deposition of sand in the lower and intermediate alluvial terraces. As such, the soils in the site are predominantly characterised by sandy soils with topsoils and sub-soils comprising sands and fine clays.

The following measures should be implemented for topsoil and subsoil stripping:

- Materials should not be stripped when too wet or too dry.
- When stripped, materials should be used directly for rehabilitation to the maximum practicable extent or stockpiled and preserved for future use.
- Stockpiling of materials should not exceed a height of 2 m and should be shaped and revegetated to protect the soil from erosion and weed infestation.
- Stockpiles should be maintained in a free draining condition and long-term soil saturation should be avoided.
- Runoff waters external to the areas to be stripped should be diverted away from the working area.
- Stripping of topsoil should be limited to the minimum area necessary.

The following measures should be implemented for topsoil and subsoil spreading:

- Whenever possible, stripped materials should be directly placed on an area undergoing rehabilitation.
- Areas to be re-spread should be shaped prior to placing materials over the re-profiled surface.
- Equipment used to spread materials should be scheduled to avoid compaction.
- Before respreading the materials, loosen the underlying substrate to break up any compacted or surface sealing and to enable keying of the two (2) materials.
- On slopes less than 3(H):1(V), loosen lightly compacted substrate, ensuring all ripping operations occur along the contour.
- Materials are to be removed from stockpiles in a manner that avoids vehicles travelling over the stockpiles.
- Materials are to be respread in the reverse sequence to its removal so that the original upper soil layer is returned to the surface to re-establish the entrapped seed content of the soil.
- Ensure all exposed substrates are covered with a minimum 150mm of suitable topsoil / subsoil to enable success of revegetation.
- After spreading materials, ensure the surface is left in a roughened state to assist moisture infiltration and inhibit soil erosion.
- Prior to any revegetation, cultivate any compacted or crusted topsoil surfaces (to a depth no greater than the depth of the materials to be spread).
- Spreading is to be immediately followed by revegetating wherever possible.
- If erosion occurs on treated surfaces, the area is to be re-spread with additional materials and revegetated.

Species Selection

As the site is to be returned to grazing in line with the pre-development landform, pasture species are recommended for revegetation. Pasture species that may include, but are not limited to:

- Brachi hybrid; Brachiaria hybrid (Brachiaria spp. hybrids)
- Buffel grass (*Cenchrus ciliaris)*
- Digit grass (*Digitaria eriantha*)
- Forest blue grass (*Bothriochloa bladhii* subsp. glabra)
- Indian bluegrass (*Bothriochloa pertusa*)
- Pangola grass (*Digitaria eriantha*)
- Panics (*Panicum maximum*)
- Perennial forage sorghum, 'Silk' sorghum (Sorghum)

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- Prairie grass (*Bromus wildenowii*)
- Rhodes grass (*Chloris gayana*)
- Sabi grass (*Urochloa mosambicensis*)
- Tall finger grass (*Digitaria milanjiana*) [1]

These species are indicative only. The species used may be any combination of these species and should be selected at the time of revegetation based on availability at local suppliers.

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

Water Bodies
Water bodies are likely to remain within the final landform, created through the final extraction void and sediment basins utilised for stormwater management during the operational phase of the quarry.

Water bodies are to be converted to clean water storages where they are to be retained in the final landform. This can be achieved by:
- Cleaning sediment from the base of water storages.
- Battering slopes to achieve grades of no more than 3(H):1(V) where practicable.
- Ensuring that the water quality within these water storages is suitable for future use.

Rockhampton Sands is to engage a suitably qualified person to assess water quality of any residual water bodies at the site to ensure that the release parameters specified by the EA conditions, or other water quality objectives agreed with the administering authority.

Land Contamination
Prior to site closure, a contaminated land assessment by a suitably qualified person may be required. Assessment of site contamination, if required, is to be undertaken and managed in accordance with the following:

- *National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013)*
- *AS 4482.1-2005 - Guide to the sampling and investigation of potentially contaminated soil. Part 1 – Non-volatile and Semi-volatile compounds.*
- *AS 4482.2-2005 - Guide to the sampling and investigation of potentially contaminated soil. Part 2 – Volatile Compounds.*

Should it be identified that areas of the site have been contaminated through the operational activities, these areas are to be remediated, and validated as contaminant free, prior to site closure.

Infrastructure
Infrastructure that is to remain on-site after the surrender of the approvals may only be retained where a landowner agreement has been provided to the administering authority which clearly itemises the

[1] Pastures Australia., (n.d.). Pasture Selection Tool. Accessed via https://keys.lucidcentral.org/keys/v3/pastures/queensland.htm

4.7	Rehabilitation Management Plan
	infrastructure that will remain, and detail the condition it is to remain in. It is anticipated that the following infrastructure would be suitable for retention: • Utilises and services (e.g. water, electricity, telecommunications, gas). • Access tracks and roads. Plant, equipment, and buildings (including demountable and mobile infrastructure) should be removed from the final landform. A landowner's agreement should be prepared at cessation of the rehabilitation to confirm satisfaction with the rehabilitation site and for retention of any infrastructure within the landform.
Monitoring	Rockhampton Sands must undertake a monitoring and maintenance period following the rehabilitation phase and action any remedial measures to ensure the rehabilitated landform transition to a self-sustaining state. The Operations Manager or delegate must conduct regular inspections of any rehabilitated areas to ensure maintenance and repairs are carried out as necessary. Maintenance works may include fertilising, watering, repairs to barriers, guards and plant failure replacements, refer to Table 12 – Maintenance Schedule for Revegetation Works. The monitoring and management program will review the ongoing success of the rehabilitation treatment. The Operations Manager or delegate may engage a consultant to assist with any detailed monitoring or management of rehabilitation. The key parameters to be measured as part of the rehabilitation monitoring and management program will include: • Landform stability. • Erosion and sedimentation. • Groundcover success (<70% desirable). • Vegetation species composition and density. • Water quality. • Weed presence. Final rehabilitated areas are to be visually monitored by the Operations Manager or delegate and, where relevant, assessed by suitably qualified persons to determine the effectiveness of measures implemented.
Contingency Plan	In the event that monitoring identifies failures in the rehabilitation implementation, the following contingency measures may be used, however; these will be adapted to the particular failure identified: • Replacement of failed plantings to increase establishment / success rates. • Use of fertilisers and soil ameliorants where necessary. • Reprofiling or eroded or failed landforms. • Application of additional topsoil where necessary to support vegetation growth. • Impletion of additional erosion and sediment controls. • Water quality improvements where necessary.

Table 11 – Key Performance Indicators for Rehabilitation

KPI Description	Measure(s)	Critical Timeframe
Total land disturbance at any one time is limited to that necessary to advance the next stage	Demarcation of limits.	Continuous review in accordance with development of the site.
Sufficient topsoil for rehabilitation is retained.	Volume (m^3) of topsoil and subsoil retained for rehabilitation.	At implementation and completion of each development stage.
The final landform demonstrates consideration for the surrounding undisturbed areas and land zoning.	True / False.	Prior to lodgement of application for surrender.
Groundcover achieves a suitable density to protect surface soils from rain-induced erosion (DES 2014).	Groundcover at a minimum of 70% (DES 2014).	• Assessment prior to any stormwater management device reduction or removal; and, • Final assessment prior to surrender application.
Erosion rates of soil / sediment from disturbed areas associated with the extractive industry activities does not exceed natural rates experience for the locality.	Local erosion rate calculated and compared against actual site erosion rates.	Within three months of completion of each stage of the quarry (including at final stage).
Evidence that water quality of any residual water bodies complies with the water quality objectives of the EA or other agreed release parameters. Alternatively, water bodies are to be filled and stabilised with vegetation to create a clean, free-draining catchment.	Water quality objectives of EA conditions or other agreed Water Quality Objectives (e.g., Livestock Watering Guidelines).	Prior to lodgement of a surrender application for the EA.
Air quality of the final landform achieves levels consistent with adjacent undisturbed areas through establishment of the final landform.	Visual surveillance and complaints register review. If monitoring is required, refer to Section 4.1 - Air Quality Management Plan contained in the EMP.	Prior to lodgement of a surrender application for the EA.
Assessment confirms the slope stability of final landforms.	Slope ratio, degree, or percentage.	Prior to lodgement of application for surrender.
Landowner statement(s) obtained for: a) any retained items of extractive industry-related infrastructure; and b) satisfaction with the rehabilitated final landform.	True / False.	Prior to lodgement of application for surrender.

Table 12 – Maintenance Schedule for Revegetation

Activity	Frequency
Weed Control	
Site Preparation (where necessary)	One (1) treatment at least two (2) weeks prior to seeding / planting.
Ongoing weed management	Biannually or as required.
Revegetation	
Monitor performance and conduct any necessary maintenance.	• One (1) month after seeding / seedling planting. • Three (3) months after seeding / seeding planting. • Six (6) months after seeding / seedling planting. • 12 months after seeding / seedling planting. OR • Following significant rainfall events (e.g., >25 mm).
Replace diseased or dead plants.	As necessary following maintenance inspections.
Fertilise (if applicable)	Two (2) months after topsoil spreading or seeding.
Apply mulch (if available)	One-off around tube stock plantings
Pasture management	
Slashing and fertilising	As required.

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attachments

Attachment 1

Annual Environmental Performance Review

Annual Environmental Performance Review

Site:
Date:
Reviewer:

Approvals

1. Have there been any changes to the site approvals?

   Note: consider the Environmental Authority, Development Permit, etc.

   Yes ☐ No ☐

   If yes, provide details of the change (e.g. change to Environmental Authority condition, or Development Permit condition). Include the date / reference number of the current approvals relevant to the site activities.

Environmental Monitoring

2. Has all monitoring required under the Environmental Authority been carried out?

   Yes ☐ No ☐

   If no, provide details

3. Has all monitoring required under the Environmental Management Plan (EMP) been carried out?

   Note: Refer to Section 4. Environmental Management Plans for monitoring requirements.

   Yes ☐ No ☐

   If no, provide details

4. Were any exceedances of the approval limits recorded?

Yes ☐ No ☐

If yes, provide details.

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5. Was the exceedance reported to the administering authority?

Yes ☐ No ☐

Provide details of any notifications to the administering authority and actions taken to address the exceedance (if any).

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Complaints / Incidents

6. Have any complaints been received, or environmental incidents reported, over the previous 12 months?

Note: An environmental incident generally relates to an event which has caused, or threatens, serious or material environmental harm, consistent with the duty to notify of environmental harm under Division 2 of the *Environmental Protection Act 1994*.

Yes ☐ No ☐

If yes, briefly summarise the nature of the complaint and/or incident and any action taken to resolve the matter.

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Site Operations

7. Have there been any changes to the site operations over the previous 12 months?

Yes ☐ No ☐

If yes, provide details and determine if any change to the EMP or associated management documents are required.

____
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Proposed Measures for Improved Environmental Performance

8. Are any measures proposed to be implemented over the coming 12 months to improve the environmental performance of the site?

Note: Examples of measures may include; revised stormwater management measures, changes to fuel / chemical storage, etc.

Yes ☐ No ☐

If yes, provide details and determine if any change to the EMP or associated management documents are required.

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Attachment 2

Groundwater Monitoring Program

ROCKHAMPTON SANDS QUARRY

GROUNDWATER MONITORING PROGRAM

Prepared for:
Nine Mile Sands Pty Ltd

Date:
November 2021

File Ref:
documents / 2493.610.001

Document Control

Project/ Report Details

Document Title:	Rockhampton Sands Quarry Groundwater Monitoring Program
Principal Author:	D. Doolan
Client:	Nine Mile Sands Pty Ltd
Ref. No.	2493.610.001

Document Status

Issue	*Description*	*Date*	*Author*	*Reviewer*
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1	Groundwater Monitoring Program	November 2021	S. Lyons	Y. Dowling

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1. Introduction

1.1 Background

Groundwork Plus have been engaged by Nine Mile Sands Pty Ltd, trading as Rockhampton Sands, to prepare a Groundwater Monitoring Program ('GMP') for the extractive industry operation located at 250 Fogarty Road, Fairy Bower, QLD 4700, properly described as Lot 250 on R2621 (the site).

The extractive industry operation is approved under Environmental Authority ('EA') (EPPR00700213) for the following prescribed Environmentally Relevant Activities ('ERAs') under the *Environmental Protection Regulation 2019* ('EP Reg'):

- ERA 16 Threshold (2)(a) Extracting, other than by dredging, in a year, the following quantity of material – more than 5,000 tonnes per year but not more than 100,000 tonnes per year; and
- ERA 16 Threshold (3)(a) Screening, in a year, the following quantity of material – more than 5,000 tonnes per year but not more than 100,000 tonnes per year.

Under the existing EA, a Groundwater Monitoring Program ('GMP') is required to be prepared for the operation.

1.2 Purpose of the Groundwater Monitoring Program

Condition G6 of the current EA, requires a GMP to be developed to address at least the following:

a) The installation of at least 3 monitoring bores around the property boundary of the proposed quarry site;
b) Groundwater level in monitoring bores must be recorded at least once in every month to an accuracy of 0.01 m;
c) Where quarrying is conducted by removal of groundwater prior to the extraction of quarry material, using an appropriate flow meter, the volume of groundwater extracted from all groundwater sources used in the operation must be determined and recorded as monthly totals.

Groundwater monitoring has been undertaken at the site historically, however, this groundwater monitoring is understood to have not been formally captured and documented in a GMP. Complicating matters, is that the current operator, Rockhampton Sands, acquired the site in early 2020, with the EA transferred on 8 April 2020. Documentation and information provided to Rockhampton Sands by the previous EA holder were limited in nature, resulting in uncertainty as to whether a GMP had indeed been prepared. Given the future increase in extraction volumes, Rockhampton Sands has nominated to prepare a GMP for the existing and future operations.

1.3 Site Details

Site details are summarised below in Table 1 – Site Details.

Table 1 – Site Details

Real Property Description:	Lot 250 on R2621
Location:	250 Fogarty Road, Fairy Bower, QLD 4700 (refer Figure 1 – Aerial Photo and Cadastre)

	 Figure 1 – Aerial Photo and Cadastre (Source: QLD Globe)
Tenure:	Freehold
Site Area:	36.5 hectares
Access:	Fogarty Road
Existing Land Use:	Extractive Industry
Proposed Land Use:	Extractive Industry
Local Authority:	Rockhampton Regional Council

1.4 Description of Activities

The proposed development is for an increase to the production volumes of the existing sand extraction operation located at 250 Fogarty Road. With local infrastructure projects, it is expected that in the short term, up to 1,000,000tpa of material will be required to support these developments. Once the main local infrastructure projects have been completed, it is anticipated that the demand for material will reduce to 250,000tpa.

The proposed increase to the extraction volume can be facilitated with minimal changes to the existing operation with the processing plant already designed to produce 1,000,000tpa. The proposed increase to the annual extraction volume will also not result in any changes to the approved area of extraction or depth of extraction.

Rockhampton Sands will continue to use the current wet extraction method that involves dredging of the raw material from the pit, where it is then pumped to the wash plant. The screening operations are conducted adjacent to the extractive area using the newly constructed wash plant. Extracted sand is delivered directly to the wash plant and the raw feed is washed to remove clay and other impurities, then screened to produce sized material. Once screened, the product is stockpiled using machinery in the main stockpile area. The water pumped to the wash plant is directed through four (4) silt traps before returning to the pit.

Processed product is stockpiled in segregated and clearly identified areas to ensure no product mixing. All products are despatched from site via the weighbridge.

2. Description of Environmental Values

2.1 Regional Context

2.1.1 Land Use

Refer to Figure 1 – Aerial Photo and Cadastre for an illustration of the site and surrounding area and Table 2 – Adjacent Land Uses provides a summary of the land uses surrounding the site.

Table 2 – Adjacent Land Uses

Direction	Land Use
North	Vacant land / agricultural activities, noting that Rockhampton Sands also own Lot 3 CP LN883, 4 CP LN883 and Lot 1 RP 603316.
East	Fogarty Road thence a separate extractive industry operated by others.
South	Vacant land / agricultural activities
West	Vacant land / agricultural activities

2.1.2 Nearest Sensitive Receptors

Nearest sensitive receptors, relevant to Groundwater, is outlined in Table 3 – Nearby Sensitive Receptors.

Table 3 – Nearby Sensitive Receptors

Sensitive Receptor	Description and Location
Residence	The nearest residence is situated approximately 600 north, noting that Rockhampton Sands own the nearest residence which is on Lot 3 CP LN883.
Protected area or critical area	There are no conservation or protected areas within 10 km from the site.
MSES	Refer to Section 2.3.
Marine Park	There are no Marine Parks within 10 km from the site.

2.1.3 Regional Climate

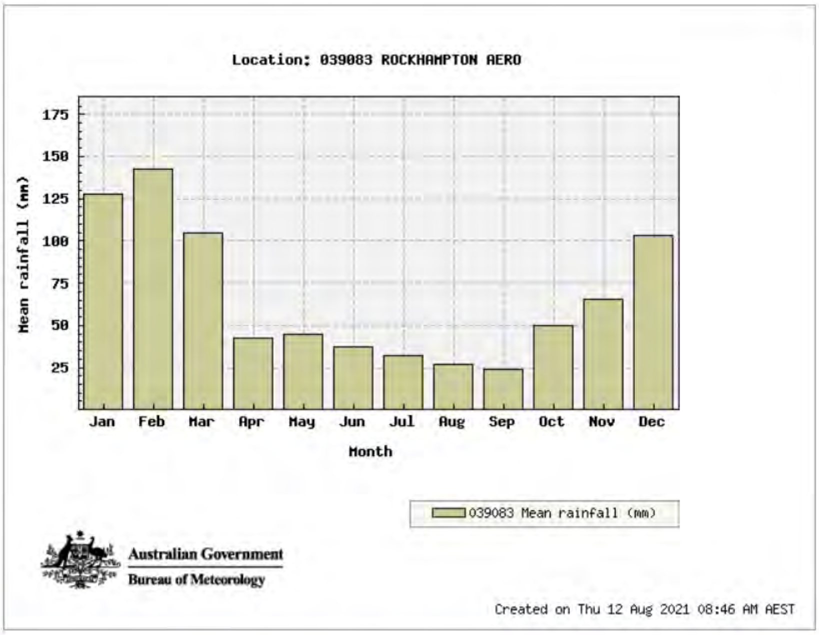
The Bureau of Meteorology describes the Rockhampton climate as follows:

Rockhampton climate may be classified as Subtropical. The city is situated on the Tropic of Capricorn and lies within the southeast trade wind belt, too far south to experience regular northwest monsoonal influence, and too far north to gain much benefit from higher latitude cold fronts. Rockhampton's average annual rainfall is a little over 800mm. Rainfall averages suggest a distinct wet and dry season, with the wet generally December to March and the dry June to September.
Typical daytime temperature ranges are 32 max 22 min in the summer /wet season and 23 max 9 min in the winter/dry season.

The prevailing winds are predominately southeast but during spring and summer late afternoon northeast sea breezes give some relief from the higher temperatures. During winter and early spring the high-pressure systems of the sub-tropical ridge can be far enough north to replace the southeast trades with southwesterlies winds behind the trough systems that split the high cells. Rockhampton lies within the cyclone risk zone and the area is subject to summer thunderstorms. There is a high incidence of winter and early spring fogs. Maximum temperatures in the low to mid 40's have been recorded in October to March. Minimum temperatures as low as zero have been recorded during winter.

The Fitzroy River at Rockhampton has a long and well documented history of flooding with flood records dating back to 1859. The highest recorded flood occurred in January 1918 and reached 10.11 metres on the Rockhampton gauge. The most recent major flood occurred in January 1991 following the coastal crossing of Tropical Cyclone Joy near Ayr on 26th December 1990. The flood was the third highest on record and rose to a height of 9.30 metres on the Rockhampton gauge.

Average rainfall is presented below in Graph 1 – Average Rainfall



Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years
Mean rainfall (mm) for years 1939 to 2021	127.6	142.6	104.8	42.7	44.6	37.6	32.0	27.2	24.0	49.7	65.5	103.0	799.0	82

Graph 1 – Average Rainfall

The rainfall pattern shows a wet summer and dry winter.

2.2 Land

2.2.1 Topography

The topography of the site is described as predominantly open and flat with slopes of less than 5% covering the entirety of the area to be developed.

2.2.2 Acid Sulfate Soils

A preliminary Acid Sulfate Soil investigation was undertaken in 2010 as part of initial site investigation to support the original application for the extractive industry. The results of the investigation, determined a very low potential for ASS presence across the site, with only 3 samples of the 57 samples tested indicating the presence of Potential ASS. The Potential ASS was present within the northeast corner of the site.

2.2.3 Geology

The regional rock types are slightly metamorphosed sediments of Devonian-Permian age; mainly indurated shales, limestones, cherts and calcareous grits. These sediments have been intruded by granite in areas. Tertiary basalt covers an area to the west of the Fitzroy River and extends under the alluvium in the neighbourhood of the main channel near Splitters Creek (site of the Rockhampton Barrage). The Fitzroy River has produced an extensive alluvial development to the west of Rockhampton with the river eventually merging into the estuarine environment of the coastal delta between Yeppoon and Gladstone.

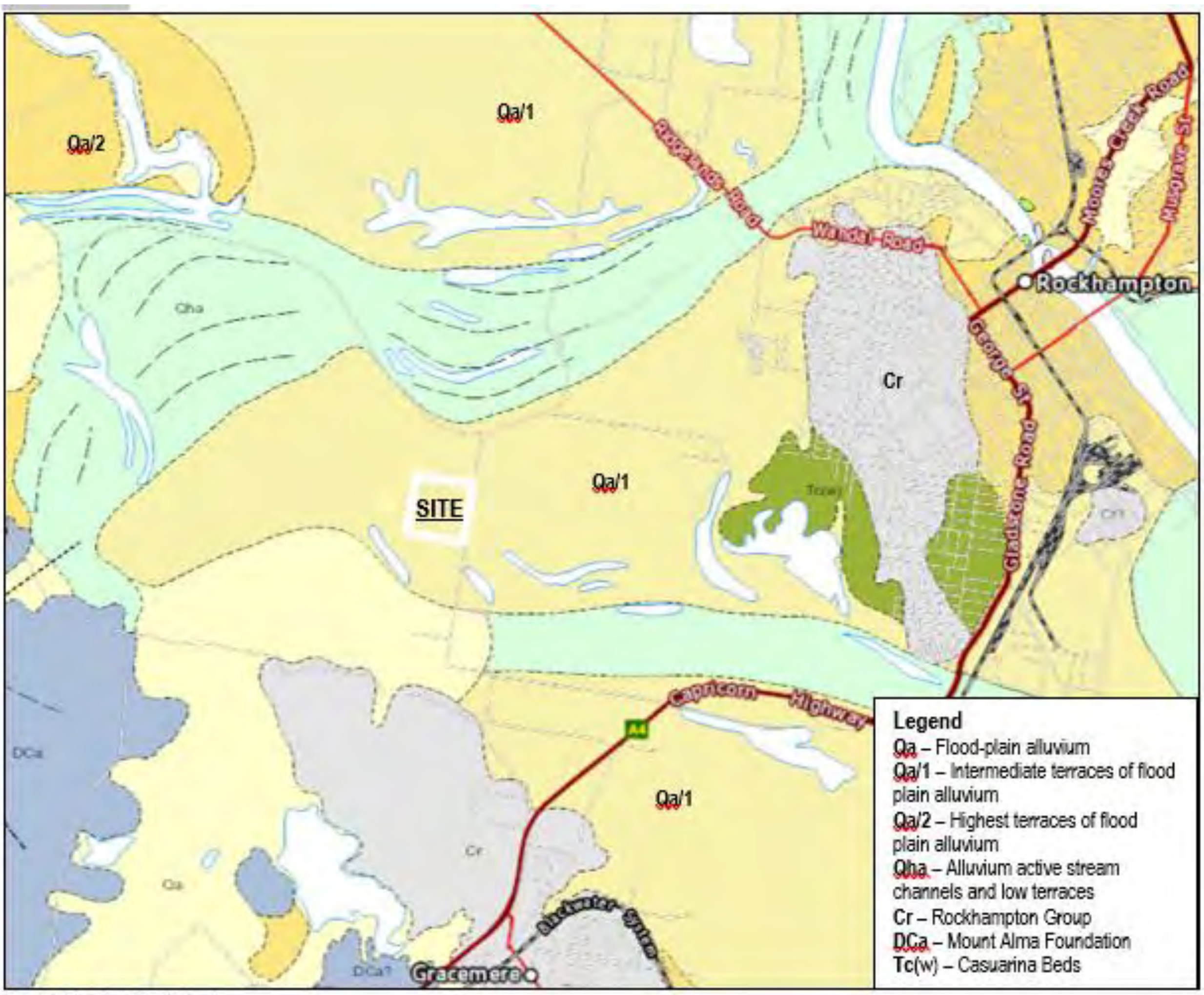


Figure 2 – Geology

The site itself lies within the Fitzroy River flood plain, which is responsible for the creation of the sand deposit. Over time, the Fitzroy River has altered its location which is evident from the various lagoons and oxbow lakes present today. The changing course of the river and the numerous flooding events has resulted in the deposition of sand in the lower and intermediate alluvial terraces.

2.3 Water

2.3.1 Watercourses

The site does not have any watercourses mapped within its boundary under either the VMA or the *Water Act 2000* (Water Act, with the nearest being Lion Creek to the north (approximately 650 m), and Neerkol Creek (approximately 1.8 km south), refer to Figure 3 – State Watercourse Mapping.

There are several mapped lakes (defined by *Water Act 2000*) surrounding the site as shown in Figure 4 – Mapped Lakes. No lakes are present within the site boundary or extraction footprint.

Figure 3 – State Watercourse Mapping

Figure 4 – Mapped Lakes

2.3.2 *Surface Water Quality Objectives and Environmental Values*

The site is within the Fitzroy South / Central Tributaries of the Fitzroy Basin. High Ecological Value areas have been mapped for the wetlands surrounding the site, The Water Quality Objectives ('WQOs') for the Fitzroy South / Central Tributaries, prescribed under the *Environmental Protection (Water) Policy 2009 Fitzroy River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Fitzroy River Sub-basin September 2011*, are summarised in Table 4 – Water Quality Objectives.

Table 4 – Water Quality Objectives

Quality Characteristic	WQO
Ammonia N	< 20 µg/L
Oxidised N	< 60 µg/L
Total Nitrogen	< 1,500 µg/L
Filterable Reactive Phosphorous	< 20 µg/L
Total Phosphorus	< 50 µg/L
Dissolved Oxygen	85-110% Saturation
Turbidity	< 50 NTU
Suspended Solids	< 85 mg/L
pH	6.5 – 8.5
Conductivity (base flow / high flow)	< 445 µS/cm (low flow); < 250 µS/cm (low flow)
Sulfate	< 15 mg/L

The Environmental Values for Surface Waters within this catchment are: Aquatic ecosystems; Irrigation; Farm supply/use; Stock water; Aquaculture; Human consumer; Primary recreation; Secondary recreation; Visual recreation; Drinking water; Industrial use; and, Cultural and spiritual values.

2.3.3 *Flooding*

The site is mapped as being subject to flooding in accordance with State mapping for a 1%AEP flood event, as shown in Figure 5 – Flood Mapping 1%AEP.

Figure 5 – Flood Mapping 1%AEP

2.4 Wetlands

There are no mapped wetlands inclusive of; VMA wetlands, MSES declared high ecological value waters (wetland), MSES high ecological significance wetlands and Wetlands of high ecological significance within the site, however wetlands are present surrounding the site, which are mapped as MSES declared high ecological value waters (Figure 6 – MSES Wetlands).

Figure 6 – MSES Wetlands

These wetlands are Palustrine Wetlands, which are non-tidal, freshwater wetlands.

2.5 Groundwater

During the initial resource investigation undertaken to support the original application, groundwater was confirmed as being present at 5 to 7 m below ground level as summarised in Plate 1 below.

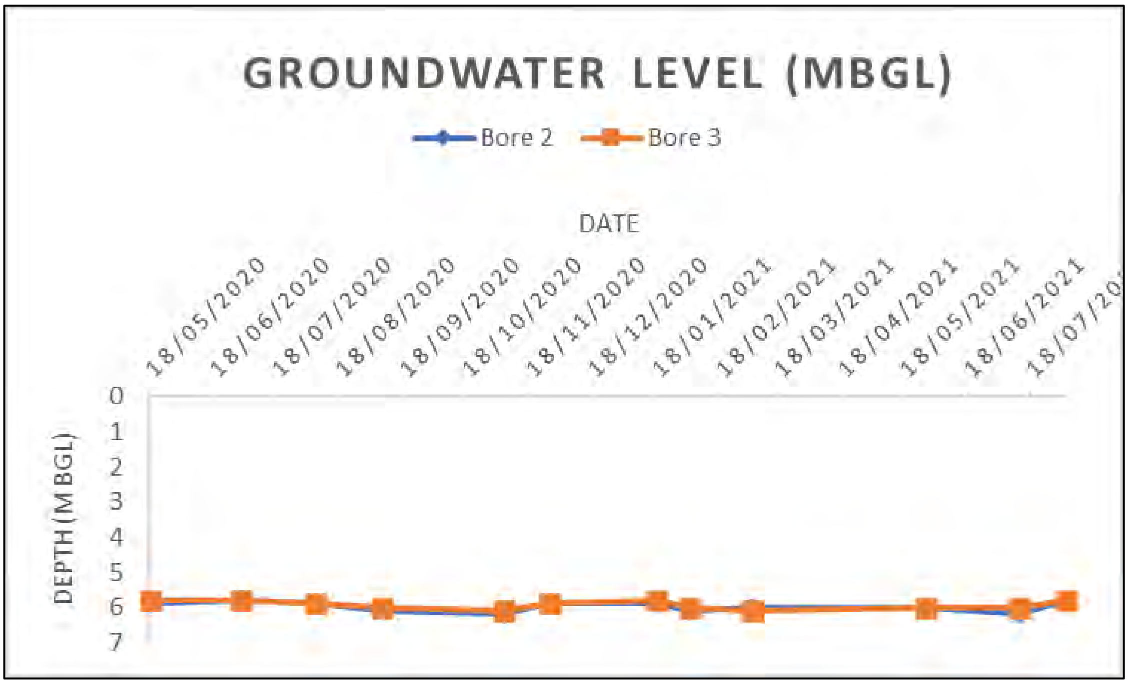
Location	Dark Brown Sandy Clay (Overburden)	(Grey/Brown) Sandy Clay/Clayey Sand (Overburden)	Brown Sand	Gravelly Sand	Total Depth	Groundwater Depth from Surfacer
BH01	0.0-3.0	3.0-7.5	7.5-15.0	-	15.0	-
BH02	0.0-1.0	1.0-4.5	4.5-15.0	-	15.0	5.0
BH03	0.0-4.0	4.0-9.5	9.5-14.5	14.5-15.0	15.0	5.0
BH04	0.0-2.2	2.2-4.5	4.5-12.0	12.0-15.0	15.0	-
TP01	0.0-3.0	3.6-6.6	6.6-7.0	-	7.0	6.7
TP02	0.0-2.0	2.0-4.5	4.5-5.3	-	5.3	5.3
TP03	0.0-2.0	2.0-6.6	6.6-7.0	-	7.0	6.7
TP04	0.0-1.4	1.4-4.8	4.8-5.2	-	5.2	5.2
TP05	0.0-1.8	1.8-3.3	3.3-5.0	-	5.0	5.0

Plate 1 – Resource Investigation Summary (Source: Cardno 2014, Material Source Assessment report).

Groundwater monitoring has been undertaken at locations BH02 and BH03 which are shown in Figure 7 – Groundwater Borehole Locations.

Figure 7 – Groundwater Borehole Locations

Recent records for these bores are detailed below in Graph 2 – Groundwater Depths.



Graph 2 – Groundwater Depths

Groundwater levels have remained relatively consistent and align with the observations made during the resource investigation (Plate 1).

With reference to the *Environmental Protection (Water) Policy 2009 Fitzroy River Sub-Basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Fitzroy River Sub-basin September 2011,* the site is within the Fitzroy Groundwater Zone, with environmental values of Aquatic ecosystems; Irrigation; Farm supply/use; Stock water; Primary recreation; Drinking water; Cultural and spiritual values. The site is not within a Groundwater Management Zone.

The site is at the interface between Groundwater Chemistry Zone 22 and 14. The relevant Water Quality Objectives for aquatic ecosystems for these water chemistry zones are detailed below in Table 5 – Groundwater Quality Objectives.

Table 5 – Groundwater Quality Objectives

Zone	Percentile	EC µS/cm	Hardness (mg/L)	pH	Alkalinity (mg/L)	Sodium (mg/L)	Chloride (mg/L)	SAR
14	20th	1006	294	7.50	284	88	129	0
	50th	1619	458	7.90	377	164	260	0
	80th	2765	743	8.10	507	308	604	1.27
22	20th	1403	367	7.20	245	145	218	3
	50th	2220	591	7.70	360	240	475	4.4
	80th	3722	7001	8.00	510	420	979	6.93

This data is for the shallow aquifer within these water chemistry zones, which is the aquifer in which the activity is undertaken.

2.6 Groundwater Dependent Ecosystems

The site is not mapped under Queensland Globe (2021) as containing any Groundwater Dependant Ecosystem' (GDE). However the BoM GDE Atlas, has mapped both aquatic and terrestrial GDEs near the site, associated with the wetlands, as shown in Figure 8 – Aquatic GDE and Figure 9 – Terrestrial GDE below.

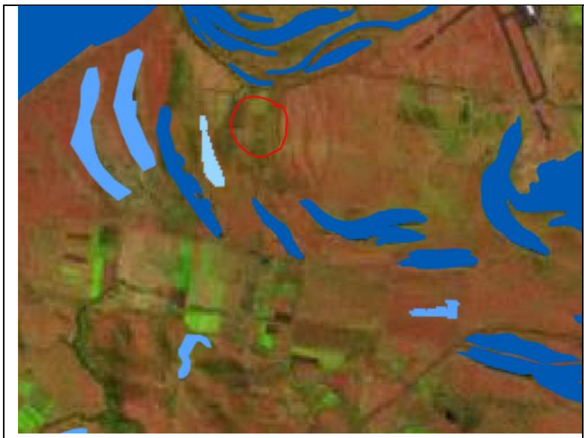


Figure 8 – Aquatic GDE

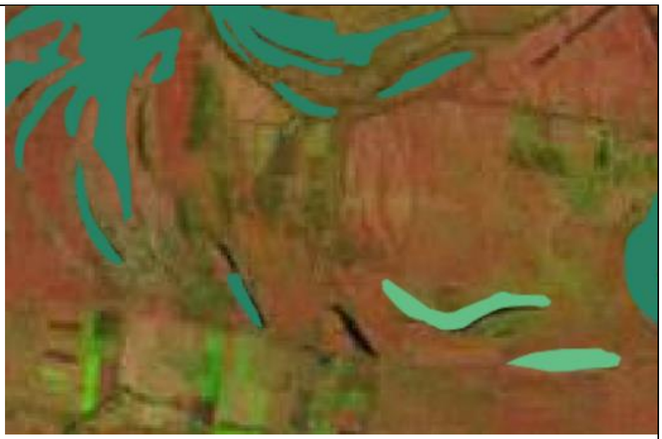


Figure 9 – Terrestrial GDE

There are no mapped GDEs within the site.

3. Groundwater Monitoring Program

The environmental values assessment has allowed a site-specific GMP to be developed as outlined in the following sections.

3.1 Purpose

The purpose of the monitoring is to determine any impacts associated with the extractive industry on the surrounding groundwater, particularly as it relates to water height. This GMP does not set limits in regard to parameters, due to natural variability evident in the area, instead relying on an ongoing assessment of data to determine degree of impacts (if any).

3.2 Groundwater Monitoring Locations

The existing groundwater bores, BH02 and BH03 will remain as part of the GMP. To complement these, an additional bore is proposed on the northern boundary of the site. In addition, the extraction void will also be included as part of this monitoring program, given that this void is a groundwater filled void.

The proposed monitoring locations are shown below in Figure 10 – Groundwater Monitoring Locations. The new proposed bore is shown as BH05, with proposed areas for installation shown in orange.

Figure 10 – Groundwater Monitoring Locations

The groundwater bores are summarised below in Table 6 – Groundwater Bores.

The proposed bore, BH05, will be required to be installed by an appropriately qualified driller with a Class 1 driller's licence, experienced specifically in environmental monitoring bore installation requirements.

Table 6 – Groundwater Bores

Bore	Coordinate (GDA2020 Lat / Long)	Bore Depth	Groundwater Depth
BH02 (Existing)	-23.39497 / 150.44973	15 m	~6 m
BH03 (Existing)	-23.39659 / 150.44895	15 m	~6 m
BH05 (Proposed)	*-23.39293 / 150.44624*	*~15 m*	~6 m
Void	-23.39225 / 150.44998	NA	-

3.3 Groundwater Monitoring Parameters

The extractive industry activity does not present a significant risk of contamination of groundwater, as the process for extraction and screening of materials does not require the use of materials that pose a risk of contamination. Minor quantities of fuels and chemicals will be stored on site, housed in appropriately designed containers.

Given the activity, the monitoring program requires the following parameters to be monitored as per Table 7 – Monitoring Parameters.

Table 7 – Monitoring Parameters

Bore	Parameter	Frequency	Accuracy
BH02 (Existing) BH03 (Existing) *BH05 (Proposed)* Void	Groundwater Level	Monthly	+/- 0.01
	pH; and, Electrical Conductivity (EC)	Quarterly	+/- 0.1 pH units +/- 20 µs/cm for EC

The above frequency of monitoring will allow determinations in changes in groundwater level, and physical-chemical indicators over time.

3.4 Groundwater Flow

The activity does not require active pumping of groundwater in order to undertake extraction. Extracted sand is delivered directly to the wash plant and the raw feed is washed to remove clay and other impurities, then screened to produce sized material. The water pumped to the wash plant is directed through four (4) silt traps before returning to the dredge pit. Neither of these activities require groundwater to be removed.

3.5 Review and Reporting

The results from monitoring are to be reviewed annually by a suitably qualified person as defined under the *Environmental Protection Act 1994* (EP Act) with the findings to be documented in a report providing:

- A summary of data collected over the 12-month reporting period.
- Comparison to historical data.
- Assessment of any observed trends and fluctuations in data.
- A summary of any potential environmental impacts to groundwater and recommended remedial action (where applicable).
- An assessment of the ongoing suitability of the GMP in relation to the site development.

In the event that the review identifies potential environmental harm, it is to be reported in accordance with Section 4.

3.6 Record Keeping

All environmental monitoring results prepared to address the requirements of the EA or this GMP are to be kept until surrender of the EA. All other information and records must be kept for a minimum of five (5) years.

All information and records must be provided to the administering authority, or nominated delegate upon request, within the required timeframe and in the specified format.

4. Incident Response Procedure

4.1 Overview

The objective of this Incident Response Procedure is to ensure that any breaches of the EA, or incidents and activities that cause or threaten to cause serious or material environmental harm, are reported, investigated, and addressed to prevent recurrence or remedy harm caused. A diagrammatic overview of incidents procedure is provided in Diagram 3 – Incidents Response Procedure Overview. The Quarry Manager will be responsible for ensuring that all employees at the site are familiar with the procedure for incidents procedures.

Environmental harm is defined under the EP Act as:

- any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.
- may be caused by an activity -
    - whether the harm is a direct or indirect result of the activity; or
    - whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors.

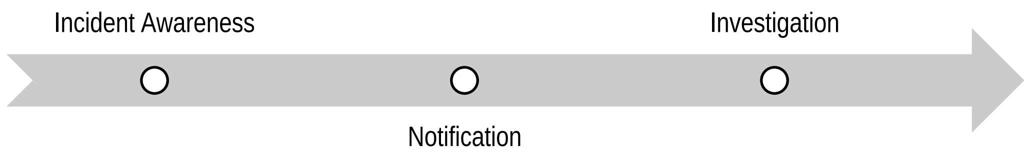


Diagram 3 - Incident Response Procedure Overview

4.2 Incident Awareness

When an employee becomes aware of an event resulting in the breach of an EA condition, or an incident with actual or potential environmental harm implications, the employee must report the incident to the Quarry Manager or delegate immediately (no more than 24 hours after becoming aware of the incident).

To demonstrate regard for the general environmental duty, all possible breaches of the EA should be reported to the administering authority as soon becoming aware of the matter, even if there is uncertainty as to whether a condition of the EA has been breached.

4.3 Notification

If the matter is an emergency, call 000.

Under Sections 320 to 320G of the EP Act, persons have a duty to notify the administering authority within 24 hours of becoming aware of any incidents or activities that cause or threaten to cause serious environmental harm or material environmental harm. In addition, the EA requires that any breach of a condition of the EA is reported no more than as soon as practicable within 24 hours of becoming aware of the breach.

The Quarry Manager must notify the administering authority via telephone and email within 24 hours of becoming aware of the incident. The contact details of the administering authority for notification purposes are as follows:

- Department of Environment and Science
- Phone: 1300 130 372 and select option 2 (during business hours of 8.30am to 5.00pm)
- Email: PollutionHotline@des.qld.gov.au

Within 14 days, or sooner, written notification detailing the following information must be provided to the administering authority:

- The name of the operator, including their environmental authority number.
- The name and telephone number of a designated contact person.
- Quantity and substance released.
- Vehicle and registration details.
- Person/s involved (driver and any others).
- The location and time of the release.
- The suspected cause of the release.

All records of the incident or breach are to be stored at the site and made available to the administering authority upon request.

4.4 Investigation

All incidents are to be investigated. The investigations should include:

- determining what activities were being carried out at the time of the incident and any equipment involved.
- identifying whether equipment or activities on-site were the cause of the incident.
- determining what potential actions may be carried out to resolve the matter and/or minimise the likelihood of further impacts.

Corrective action is to be implemented and an assessment conducted to determine what actions are to be taken to remedy the matter and/or prevent a similar incident from occurring.

Where monitoring is required to investigate an incident (e.g. water quality monitoring), a suitably qualified person as identified under the EP Act must be engaged to perform the monitoring and interpret any results.

5. Concluding Remarks

This GMP has been prepared to guide ongoing groundwater monitoring at the site. The risk of impacts to groundwater associated with the activity is low, other than impacts to groundwater heights as a result of evaporation of the groundwater exposed through the water filled void.

The monitoring program is designed to collect relevant information over time to assess the ongoing impacts (if any) of the activity on groundwater resources.