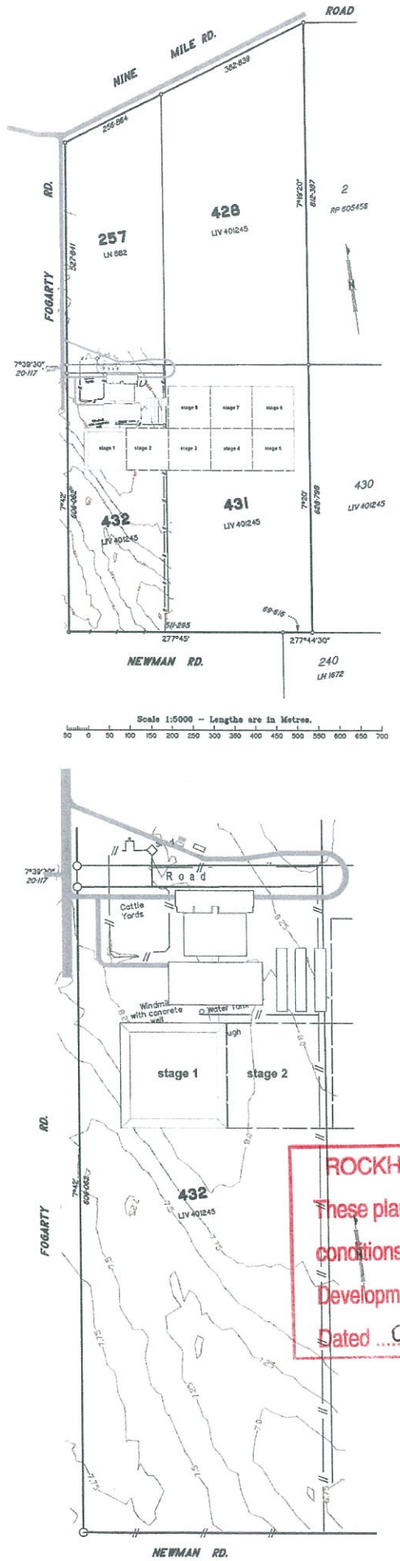
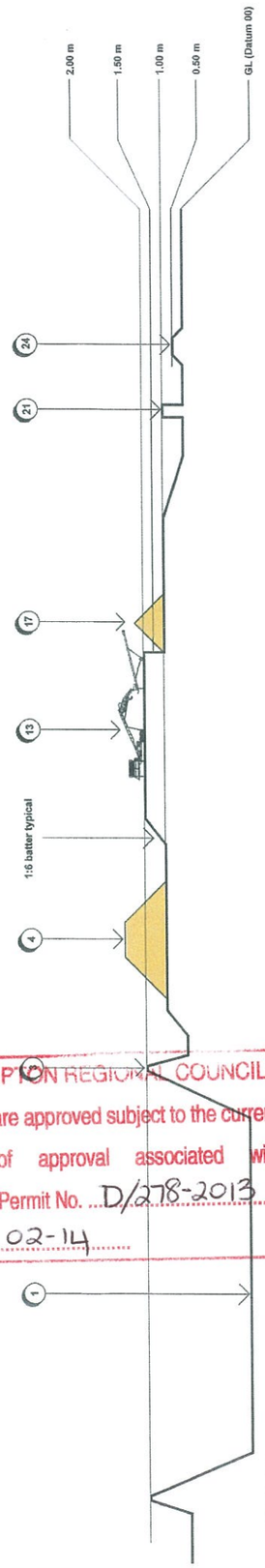




ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current conditions of approval associated with Development Permit No. D/278-2013
Dated 05-02-14

GENERAL NOTES

1. THESE DESIGNS, DRAWINGS AND SPECIFICATIONS AND THE COPYRIGHT THEREOF ARE THE PROPERTY OF TAPSELL CONSULTING ENGINEERS PTY LTD AND MUST NOT BE USED, RETAINED OR COPIED WITHOUT WRITTEN AUTHORITY OF TAPSELL CONSULTING ENGINEERS PTY LTD.
2. ALL DIMENSIONS SHOWN SHALL BE VERIFIED ON SITE PRIOR TO CONSTRUCTION AND/OR PREFABRICATION

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	Proceesing 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
29	Shed

NO.	AMENDMENT	DATE	INTL
C	Access Road alignment revised	14/9/11	
B	Development align revd to clear road	8/8/11	
A			

TAPSELL CONSULTING ENGINEERS Pty Ltd
14 Milford Avenue North Rockhampton

Approved: _____ RPEQ 3164
Date: _____

Client
Paul Waardyk

Project
Proposed sand and gravel extraction and processing facility

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

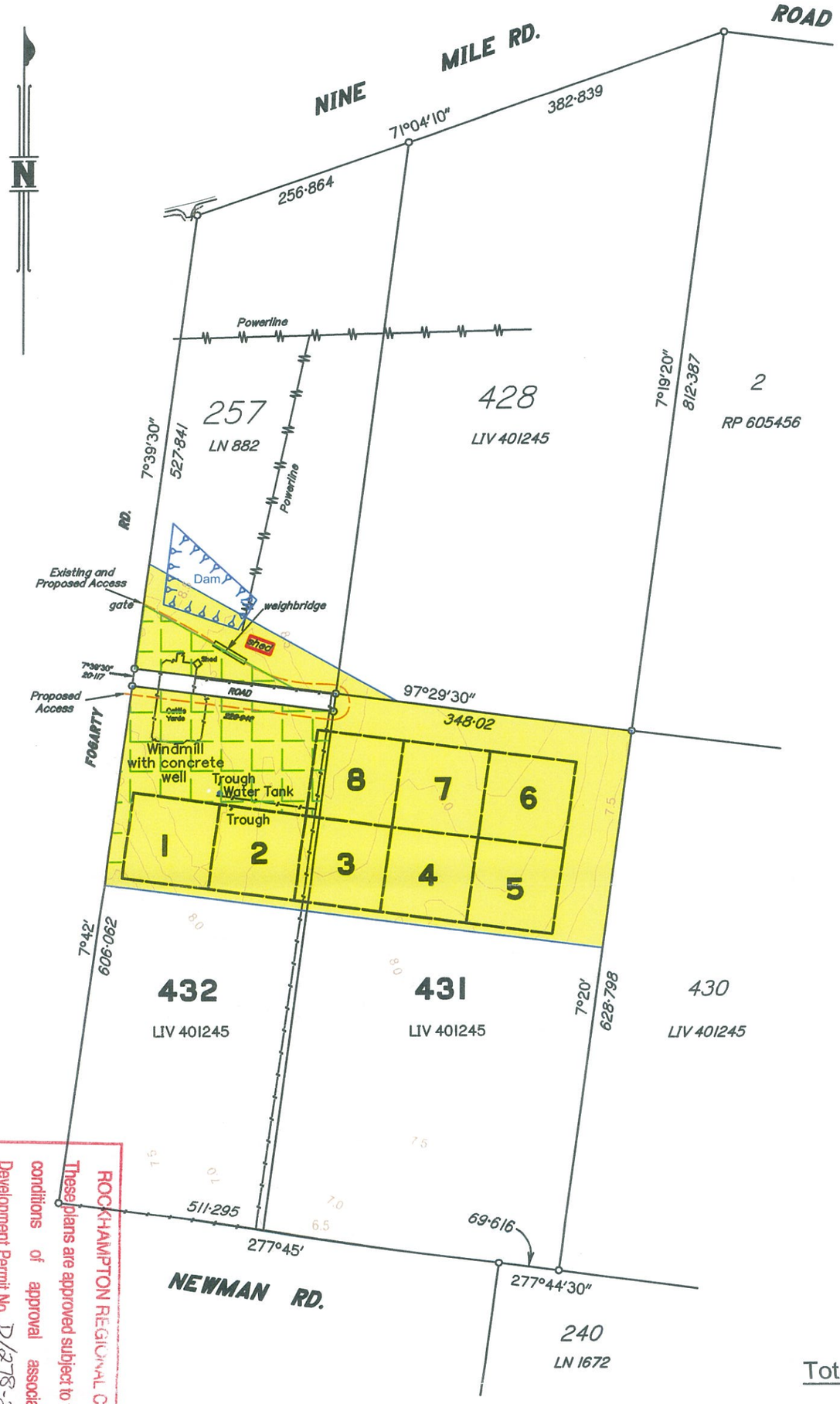
Drawing Title
Proposed Site Development Layout

DRAWING PRODUCTION

Design	DMW
Drawn	DMW
Checked	PW
Date	Aug 2011

Scale	Sheet Size	Drawing No.	Rev.
1:100	A0	WD 1057.1	C

Sheet	of
1	1



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Work Area

4.723 ha

Extraction Areas
(1ha each)

Project Area in:

Lot 428	1014 sqm
Lot 257	1.74 ha
Lot 432	5.46 ha
Lot 431	8.69 ha

Total Project Area .... 15.99 ha

Scale 1:7500 – Lengths are in Metres.

100 0 100 200 300 400 500 600 700 800 900 1000 1100

Plan of:

Location of Proposed Project Area

Notes:
This plan was prepared to accompany an application to the Rockhampton Regional Council and should not be used for any other purpose.
The dimensions and areas shown hereon are approximate only and subject to field survey andalso to the requirements of council and any other authority which may have requirements under any relevant legislation.
In particular, no reliance should be placed on the information on this plan for any financial dealings involving the land.
0.25m Contours on AHD derived from PSM 45162. RL 7.841 (4th Order)

This note is an integral part of this plan.

SCHLENCKER SURVEYING
A.B.N. 37 147 098 815
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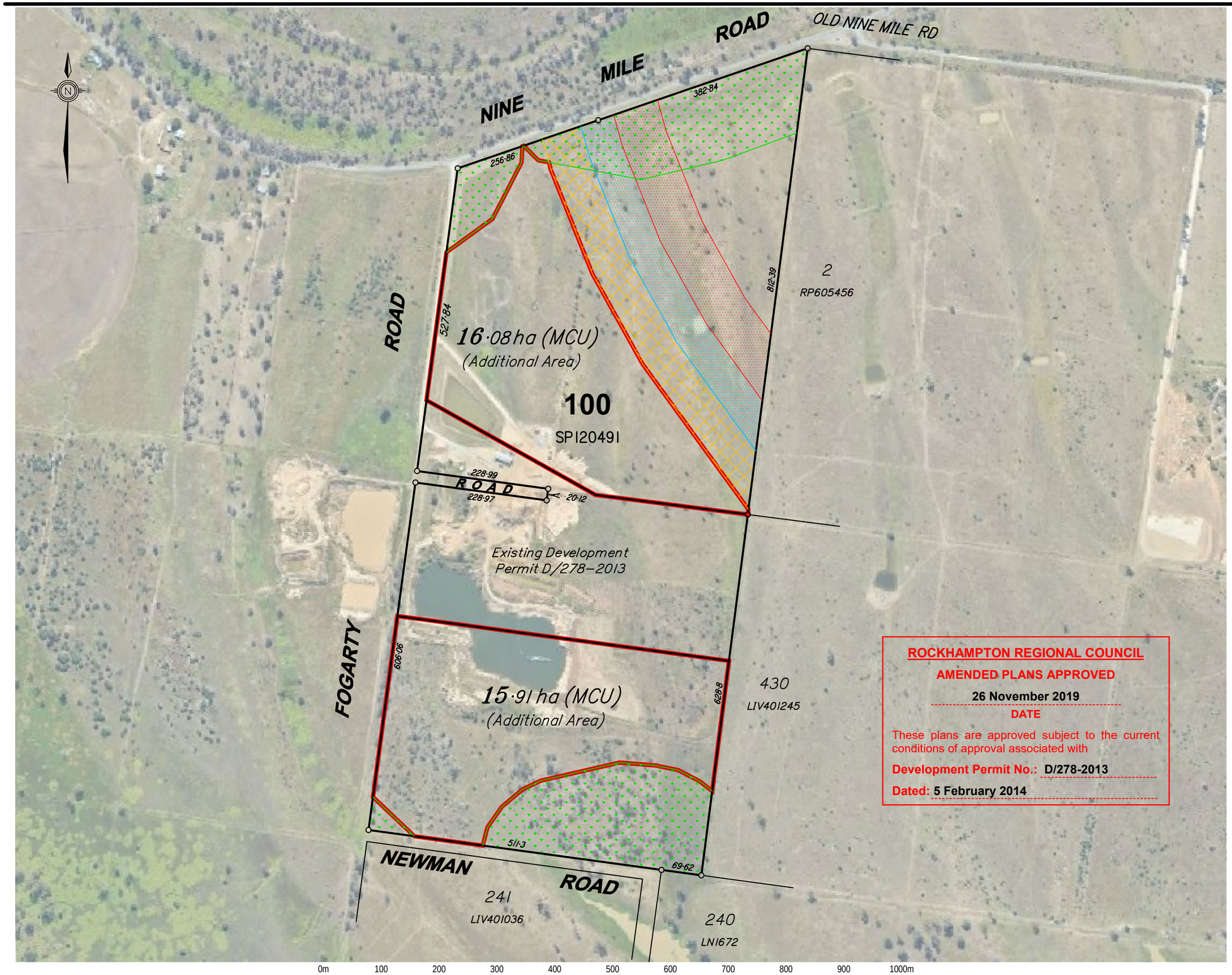
181 East St., ROCKHAMPTON
Ph. (07) 49 271744
Fax (07) 49 223164
Also at BRISBANE & GOLD COAST

Horizontal Datum: C.A.M.	Drawn: DCE	Scale 1:7500 @ A4	
Meridian: MGA by RTK GPS	Date: 18-11-2011	Parish ROCKHAMPTON	
Vertical Datum: AHD	AutoCAD Scale: 1:1000	County: Livingstone	
Derived from: -	Backup -	Ref: 6208-06	Rev: B



Denotes Proposed MCU Expansion (Total 31.99ha)

Denotes Future State Controlled Road

Denotes Future Railway Land

Denotes Proposed 70m Railway Buffer

Denotes 200m HES Wetlands Buffer

IMPORTANT NOTE

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ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

26 November 2019

DATE

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/278-2013

Dated: 5 February 2014

client

P. Waardyk

project

Nine Mile Road, Fairy Bower

plan of

Material Change of Use
(Extractive Industry)
'Other Change'
(Existing Development Permit D/278-2013)

rpd

Lot 100 on SP120491

lga

Rockhampton Regional Council

issue	date	details	authorised
A	14-06-2019	Initial Issue	RJKF
-	-	-	-

created

capricornsurveygroupcq
SURVEYING & PLANNING SOLUTIONS
07 4927 5199 | reception@csgcq.com.au | 132 Victoria Parade, Rockhampton QLD 4700

scale **1:6000 @ A3**

datum **-**

sheet no. **1 of 1**

cad file **7379-01-MCU-A**

plan no. **7379-01-MCU**

issue **A**

Hardcore Performance Pty Ltd

ABN: 35356789970
Address: 26 Gremalis Drive Nth Rockhampton
Phone: 0417 640 634
Fax: 07 49361448
E-Mail:hardcoreperformance@bigpond.com.au

Site Management Plan to Extract Sand from the Corner of Fogarty Road & Nine Mile Road (Lots 431 & 432 on LIV401245)

CONTENTS

Section 1

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current conditions of approval associated with Development Permit No. D/278-2013
Dated 05-02-14

1. INTRODUCTION

The objective of the operation is to extract sand products in a viable manner to supply products to meet the needs of private, commercial and government organisations. It is our intention to operate the extraction in a responsible manner. This Site Management Plan describes the methodology we intend to implement for the operation of the site. It is our commitment to use efficient work methods to extract and process material with minimal waste and disturbance to the surrounding area. During operations we 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.

Throughout the operation we intend to contract CQ Civil for our mining & screening operations conducted within this permit, as they have extensive experience in sand production & environmental control, as they already operate a similar operation in the Yaamba area.

The expected rate of extraction is 250, 000 tonnes per year.

2. BACKGROUND

The director of Hardcore Performance (formally Mining Equipment Maintenance PTY LTD) have a proven track record of their commitment to the Environment as they have been involved within the quarrying and associated industries providing excellent service for private, commercial and government organisations for 13 years with the goal to provide what is considered industry best practice in regards to Environmental, Quality Assurance & Occupational Health & Safety systems. Hardcore Performance will continue to operate with a strong commitment to their responsibilities to the environment and associated agencies.

3. SITE AND METHODOLOGY

The site where the proposed extraction of sand is to be carried out is situated on the corner of Fogarty Road & Nine Mile Road west Rockhampton approx 5km from the Fitzroy River. The property is prone to flooding from time to time. The section of the site to be used for sand extraction is currently used for cattle grazing and has been for many years. No cultural heritage has been identified. Adjoining land is used for Cattle Grazing and cropping. Site maps are attached.

Real Property descriptions of properties required for proposed extraction are Lots 431 & 432 on LIV401245, with access directly off Fogarty Road via Nine Mile Road.

Material shall be extracted from the quarry site by the use of fit for purpose Earthmoving Machinery such as 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.

Method of extraction and washing:

- Topsoil and vegetation will be removed by Excavator and Articulated dump trucks and all topsoils will be placed in bund walls to be used for the rehabilitation of land.
- After top soil and overburden is removed sand will be extracted by excavator and loaded on to dump trucks (at this stage the depth of sand removed will vary subject to current watertable heights but it is envisaged that excavation with this practice will stop at a depth of 2 metres below the water). We also propose that to continue extracting sand from below the watertable (continuing from where the excavator and truck operation finished) with pumping operation, would commence using a suction type pump. Sand would be pumped up and over a screening deck, sized and then fed into a cyclone to remove excess water. The excess water would be captured and released back into the pit via a settling pond. The product will then be delivered and stock piled behind the process plant as shown in the overall site plan (Raw Material).
- When sufficient sand is stock piled at the wash plant the unwashed sand will be loaded into the screening plant, (Finlay 390) which will be fitted with 4 and 5mm screens and 1st stage rinsers, from there it will be pumped as a slurry into the Finlay 200E where it will be further washed and partially dried then stockpiled.
- Water used to wash sand will be channelled via a silt trap to the primary settling pond (#1). Washed sand will be allowed 24 hours to further drain in the Concrete bunker and excess water will enter the silt drain and be diverted to the settling pond. (Refer Diagram). Silt from the silt traps will be removed and stock piled for use in land rehabilitation.
- Washed sand will be stock piled and delivered as needed.

- Initial plant water will be pumped from a onsite bore to fill the 3rd settling pond. This will be done via a electric driven pump. Once the plant commences operations it will draw water from the 3rd settling pond via a 6inch high pressure pump and then fed into both the screen and the washing wheel, from there the recycle process continues. **NB the bore is only there as a initial set up and top up water.**
- All perimeter bund walls are to constructed from overburden at a height of 2 meters and compacted. The raw materials pads are to be elevated above ground level by 1 meter as is the concrete bunded finished process material section. The main process plant area will be elevated by 2 meters above ground level. And all internal roads will be raised by 500mm and gravelled for all weather access. The planning behind the 2 meter high bund walls is that it exceeds the RLs for this area hence in the event of local flooding we should be able to keep flood water from entering the pit area.
- As indicated on the site plan, it shows a dry plant as well. This will be use primarily for manufacturing bedding grade sand which does not require washing.

The pit will be developed in stages using strip mining methods. At the beginning of stage one the overburden that is removed will be utilised to build bund walls, roads etc. At the completion of stage one the overburden from stage two will be utilised to rehabilitate stage one therefore reducing & minimising the risk to the environment by having the smallest amount of area developed. All processed material stockpiles will be constructed in a manner so that they will be on concrete self draining pads within bunded walls where the excess water will drain to silt traps. Bund walls will also be constructed between the extraction & the processing areas.

4. IDENTIFICATION/MONITORING OF POTENTIAL CONTAMINANT RELEASE AND ENVIRONMNETAL IMPACTS:

Due to the nature in which this process is to operate we are committed to conduct on-going monitoring, and after conducting numerous risk assessments in relation to the potential of contaminants being release into any part of the environment, it has be classed as very unlikely potential as this is a reflection of the process as nothing is added to the sand or any other part of the process at any stage. In the case of a flood event, monitoring would not be practical for various reasons including:

- Accessibility to site during a flood event.
- Ability to conduct precise monitoring that would provide results relevant to the activity site would be unrealistic.
- And during a flood event it would be expected that regardless of the extraction activity that the runoff or flow over land would contain higher TSS.
- The activity site will not contain any infrastructure or storage of contaminants that would not be removed during preparation for a flood event.

Where possible machinery servicing will be conducted off site, however in the event of breakdowns & maintenance being conducted on site it will be done in a manner that ensures that no contaminants will be released to the environment (eg in bunded areas & appropriate catch trays will be used). No oils, fuels etc will be kept on site permanently.

There will be ongoing testing of extracted products to test for the presence of acid sulphates & appropriate measures will be taken in the event of inappropriate levels being detected.

5. DUST EMISSION

Dust emission will be negligible as all sand material quarried will be damp. Water trucks will be used on all internal roads during dry or windy conditions. All roads will be constructed of gravel etc. We will have an "INCIDENT LOG BOOK" for complaints which is available for auditing purposes. We are committed to meet all of the objectives of our development approval.

6. NOISE EMISSION

All machinery will be kept to manufacturers specifications which will include noise emissions devices. Between the house and the site is a buffer of grazing land and lightly timbered growth and prevailing winds are favourable for residents of the house. Any complaints will be entered into the "INCIDENT LOG BOOK".

7. STORMWATER MANAGEMENT:

Erosion from storm water off roadways will be controlled by constructing water diversion drains using waste spoil material with silt traps to minimise erosion. We will insure road maintenance will be undertaken seasonally to prevent erosion or storm water issues.

All natural water courses draining to the Fitzroy River will not be disturbed, allowing the water to flow as it always has. Operations will involve pumping water from the bore on site. All trapped run off water will be re used in the operation & the bore will then only be required to supply water to the operation when the stored water levels drop below an operational level.

The management propriety of this site will be in line with our commitment to operate in an efficient manner with minimal impact on the environment & ensuring that we meet our obligations to all relevant Legislative requirements.

A bund area will be constructed around the sand washing and processing to prevent any over land water entering. We will have regular checks on all bund walls and ongoing maintenance as required. A check for acid sulphate soils will be carried out and appropriate management developed and implemented if required.

All bund walls that are constructed in & around the working areas will be constructed in such a manner so that any overland flood water is where possible unobstructed or in the event that it is that the surrounding areas are taken into consideration & that any necessary actions are developed & implemented.

8. QUARRY DEVELOPMENT:

The entire infrastructure is to maintain its viability and obligations to the environment and customers & will be implemented before extraction is started. Planned operation hours are between 6am to 6pm, 6 days a week. We estimate a weekly average of 1923 tonne per week to be extracted. Material extracted from the quarry site will be stockpiled at the Screening Plant prior to being processed through the plant. Excess water from screening will be directed into a settling pond and allowed to filter naturally through the material back to the environment. Nothing is added to the sand before, during and after screening eliminating any contamination. Screened sand will be kept in self draining concrete bunded stock piles ready for delivery. Plan Attached. All plant and equipment will be transportable.

A portable loo will be on site (and serviced by an external contractor) as well as a storage container for safety equipment, emergency spillage kits, and security for personal effects.

9. HOURS OF OPERATION:

All traffic will be via Fogarty Road and then via Nine Mile Road. An average of 6 to 8 trips daily. The operation will be between 6am and 6pm 6 days a week or as required. As part of this application we also propose that only minimal traffic (local deliveries) will take the route of Nine Mile Rd. It is our intension that all traffic follows Nine Mile Rd to Alton Downs/Ridgelands Rd into Rockhampton and surrounding areas.

10. ELECTRICAL AND TELECOMMUNICATION:

No Electricity will be required by any operation in the process of extraction of the sand. All Telecommunication will be via mobile phone and/or Two way radio.
Site-specific communications requirements include:

- EPA Pollution & Incident Hotline 1300 130 372
- Department Natural Resources (Rockhampton) 4938 4600
- Qld Parks & Wildlife (Rockhampton) 4936 0511
- RSPCA (Rockhampton) 4921 3339
- Rockhampton Wildlife Rescue 0500 556 776

11. WORKPLACE HEALTH & SAFETY:

It is our commitment to operate the quarry in a safe and responsible manner. It is our intention to manage the site in an orderly manner ensuring a safe and efficient operation to enable the best possible use of material from quarrying. Our policy is to maintain machinery according to manufacturers recommendations and guide lines for that machine which aids the safe and efficient operation of the machinery. A well maintained fleet operated by well trained operators

greatly reduce the possibility of accidents and incidents of spillages. Emergency spillage kits will be kept on site. In the unlikely event that material is contaminated, it will be isolated and rehabilitated. Any spillage shall be recorded in an "INCIDENT LOG BOOK" to be kept at the depot office. In the unfortunate event were a spillage occurs and where needed the appropriate authorities will be notified and assistance sought if required.

12. WASTE MANAGEMENT:

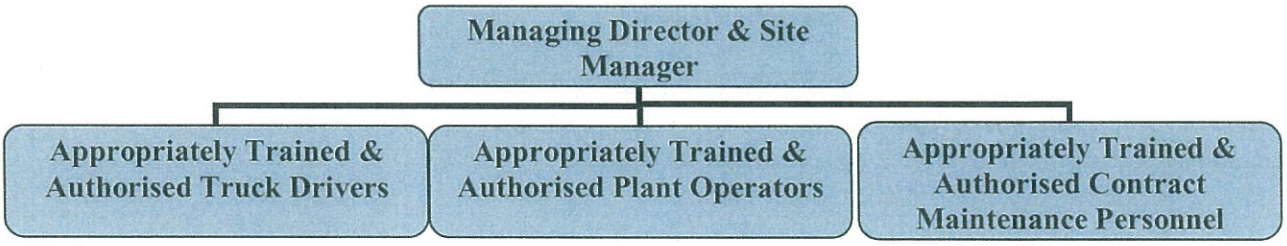
Waste prevention, treatment and disposal procedures will be focussing on avoidance, minimisation, recycling and appropriate disposal.

All refuse shall be removed from site and disposed of in the appropriate approved disposal dumps e.g. The Rockhampton Regional Council Dump on Lakes Creek Road. Where the waste is of recyclable type such as metal and paper etc this shall be handled by a contractor to an appropriate recycling facility.

To eliminate spillages, the use of oils and grease shall be restricted to that which is needed for the daily maintenance requirements of the machinery. A concreted area will be set aside for this activity.

Fuel is to be delivered on to the site as required in a fuel truck and put directly into the machinery tanks. All loaders are fitted with self greasing devices which eliminate any grease contamination and in the very minimal event of spillage while refuelling a cleanup kit is on site to remove any oil contaminates. No contaminates will enter into the sediment catchment. Major servicing, wash down and repairs will be carried out off site. Machinery in need of oil change or repair will be transported to one of the various repairers in Rockhampton. In the event of any spillage, such spillage shall be recorded in an "INCIDENT LOG BOOK" to be kept at the depot office. The "INCIDENT LOG BOOK" is also to record any complaints about noise or dust from neighbours and the necessary steps required shall be taken to rectify or deal with the matter.

13. ORGANISATION STRUCTURE:



An overall Site Manager will be appointed whose responsibility will be to carry out the daily staff organisation and operations of the plant and machinery. The site manager will be responsible for the implementation and management of the site management plan and in control of environmental management. The site manager will keep environmental records in an "INCIDENT LOG BOOK" e.g. Incidents and complaints; monitoring results for water, noise and or air. The site manager will implement the safety policy and enter training information in the "TRAINING LOG BOOK". There will be a minimum of 2 staff on site at any time.

14. STAFF TRAINING:

All staff will be certified Plant operators. All staff and personnel employed on site will be briefed on the content of the SBMP and conditions of the Development Approval. All staff will be informed that these conditions must be adhered to and will be provided with the appropriate resources and training to ensure this is possible. All staff shall be made aware of environmental management and record incidents, complaints and monitor emissions to water, noise or air. A "STAFF TRAINING LOG BOOK" will be kept on site.

15. ACID SULPHATE SOILS:

An independent Acid Sulphate soil tests have been carried out and NO Acid sulphate was detected which is also shown in the overlay map.

16. EVACUATION:

We are aware that the site is prone to flooding. Floods heights and occurrences will be monitored from information from the BOM Web Site where river heights and peak times are reported at various places of the river and its catchment and the estimated peak for Rockhampton is upgraded regularly. Also Radio reports provide a continual update. Complete evacuation can be completed in one day if necessary, however, we traditionally have up to 14 days notice before flood waters reaches the site during which time we shall evacuate all plant, machinery, containers and remove all stock piles.

17. LAND REHABILITATION:

On completion of the extraction the site will be reinstated to its natural state. This is done by shaping the area affected to blend in with the natural contours. Top soils if any will be bunded, stockpiled and later used for the rehabilitation and revegetated with local plant/tree species. At the conclusion of work the area will be levelled and returned to agricultural land and all voids will be battered and used for water storage. Where practicable progressive rehabilitation will take place. All land rehabilitation will occur to the satisfaction to the land holder (also the site manager) and DERM. Rehabilitation will include the following items:

- Erosion: A regular maintenance schedule on roads, bund areas and drains will be implemented
- Voids and Stock piles: At the conclusion of work the area where practical will be returned to grazing land and any voids will be either refilled from stock piles or battered and left for water storage for stock.
- Water Held: No sediment ponds will remain after use and water will be allowed to dissipate.
- Weeds: An ongoing weed management will be implemented
- Revegetation: Ongoing land rehabilitation and revegetation with local/plant species which are self propagating will be carried out.

18. RECYCLED AND UNDERGROUND WATER:

Water that has been used during the washing process and drained to the setting pond will be recycled both for washing Sand and in the event for dust suppression

1. Silt sediment will drain to the setting pond, settle to the bottom and leave clean water on top that can be recycled and used through the Sand washing plant.

2. Water sourced from the onsite bore would be pumped to the wash site. A 6inch pump would be used.
3. No contaminants would enter the water in any of these processes.

19. REVIEW:

Periodic review of environmental performance and procedures will be undertaken quarterly to ensure the system used is still effective, and identify opportunities for improvement. Periodic meetings with operational staff will occur to discuss and record improvement opportunities, and consulting will occur with neighbours.

20. CONCLUSON:

Hardcore Performance have a commitment to abide by the EPA Act 1994 and land management and will draw on their experience and reputation to insure all procedures are put into place.

21. EROSION & SEDIMENT CONTROL PLAN

This ESCP details how Hardcore Performance Pty Ltd will manage erosion and sedimentation during road maintenance, construction and associated bitumen work activities.

Regardless of the size of the project some form of plan is essential!

Development of the Plan

The following steps should be undertaken in the preparation of an effective erosion and sediment control plan:

- Investigate existing site characteristics;
- Anticipate and compare proposed site characteristics during and after grading;
- Determine existing and proposed drainage patterns;
- Select erosion control practices;
- Select sediment control practices;
- Outline site rehabilitation program

Step 1 Investigate existing site characteristics

Development of erosion and sediment control plans for the construction phase of a project requires investigation and consideration of the physical characteristics and limitations of the sites.

Data checked on the site should include:

- Existing topography;
- Soil types;
- Vegetation;
- Environmental sensitive areas adjacent to work site.

Examination of this data will lead to information relating to-

- Drainage lines, waterways, slopes, seasonally wet areas, stabilising vegetation, catchment area boundaries, soil types, critical natural areas and formations.

Step 2 Anticipate and compare proposed site characteristics during operations

Using the Job Specification, plans, construction tables etc. visualise the construction area and work activities and compare with the current, untouched site.

The ESCP should identify -

The nature & extent of vegetation to be cleared;
The nature & extent of earthworks (cut & fill);
Final site contours.

Step 3 Determine existing and proposed drainage patterns

The existing drainage pattern has two major components-

Sheet (overland) flow;
Concentrated (channeled) flow.

The entry / exit points of these types of water flow and the volume of the flows will dictate the impact of the work activities on the existing drainage pattern.

The proposed drainage pattern should use the existing pattern wherever possible. Preserving the natural drainage system can also retain a visual amenity that will enhance the value of the job site.

After considering the existing and proposed drainage patterns, the erosion and sediment control plan should show-

- The location and extent of proposed roads and other areas with impervious surfaces;
- The location and capacity of proposed permanent storm water drainage facilities, and methods of discharging storm water from the site;
- Any critical areas where the development plan will result in major changes to the site's drainage pattern.

Step 4 Select erosion control practices

Erosion control measures reduce the duration of soil exposure and protect the soil by shielding it, and / or holding the soil in place. These functions may improve the soil's capacity to absorb storm water run-off, thereby reducing the amount of overland run-off and its power to erode soil materials.

In general, the amount of soil material eroded and transported to streams will be proportional to run-off and the duration of flow, with erosion rates increasing run-off flow quantity and velocity. Flow quantity and flow velocity therefore, MUST be managed if erosion is to be controlled.

Soils data can be used to identify areas within the site highly susceptible to erosion, and to show the particle size distribution of the various soils.

For many soils with a high content of clay and / or fine silt, the control of erosion at the source is the only feasible strategy to prevent downstream sedimentation. It would be extremely difficult, and expensive, to try and trap these fine soil particles once they have eroded and are in suspension.

An effective erosion control strategy should therefore be developed to encompass the following objectives;

- Integrate clearing and grading with layout design;
- Keep clearing to a minimum and preserve as much of existing vegetation as possible;
- Limit grading to those areas involved in current construction activities;

- Minimise the length and steepness of slopes;
- Limit the time during which unprotected graded areas are exposed to wind and rain;

- Intercept, divert and safely dispose of clean run-off flowing onto all disturbed or critical areas, including soil stockpiles;

- Install permanent storm water drainage works as the first stage in land development;
- Reduce run-off velocities by minimising the length of flow paths, construction channels with gentle gradients, and by providing rough linings to the steeper channels;
- Apply temporary vegetation or mulch to all disturbed areas, including soil stockpiles, where construction is only partially completed but which will remain exposed for a period of 30 days or more;
- Stabilise all disturbed areas with permanent vegetation as each stage of the development is completed.

Following selection of erosion control practices, the erosion and sediment control plan should show -

- Location and design criteria of structural and vegetative erosion control measures needed to control the volume, direction and velocity of run-off;
- Details regarding the scheduling of proposed erosion control measures;
- Details regarding the maintenance of proposed erosion control measures.

Step 5 Select sediment control practices

Once erosion occurs, the resultant sediment is removed in storm water run-off and deposited in the storm water system or downstream. The rate at which sediment particles are removed from run-off depends on the size and specific gravity of the particles, the temperature of the water in which they are suspended, and the notion of the water flow.

The objective of applying sediment control measures is to ensure that conditions most conductive to deposition, and least likely to hold particles in suspension, occur at locations where deposition is desirable. If the flow of water is slowed, reduced in volume, or its flow turbulence reduced, less sediment will be transposed.

The reduction in run-off flow volume and velocity can stimulate the rate of sediment deposition, as in the case with sediment traps or basins.

The first critical step in preparing a sediment control strategy is to have an effective erosion control strategy already in place. This can reduce the number and /or size of specific sediment control measures subsequently required.

The sediment control strategy should aim to:

- Implement an effective erosion control program;
- Trap sediment as close to its source as possible;
- Locate sediment traps or basins below all disturbed areas, to retain run-off polluted by sediment;
- Locate sediment control measures above environmentally sensitive areas such as streams steep slopes;
- Subdivide drainage catchments into smaller units, at a size appropriate to the type of control measure to be used;
- Use the correct control measures to trap sediment in either sheet or concentrated flow situations;
- Identify and retain areas of existing vegetation that may have the potential to remove sediment from sheet run-off flows;

- Locate multiple sediment basins or major sediment traps so that they drain in parallel, not in series, to reduce the risk of total failure;

Ideally, sediment traps and basins should be installed at the lowest point in the watershed, or small drainage lines.

Following selection of sediment control practices, the erosion and sediment control plan, should show;

- The location and design criteria of structural and vegetative sediment control measures;
- Details regarding the scheduling of proposed sediment control measures;
- Details regarding the maintenance of proposed sediment control measures.

Step 6 Outline site rehabilitation program

Vegetation is the most effective erosion and sediment control measure, particularly in the medium to long term. The re-establishment of vegetation on all disturbed areas as soon as is feasible is therefore a critical requirement of any erosion and sediment central strategy.

As each stage is completed, permanent vegetation should be progressively established on all disturbed areas where no further construction activity will take place.

Temporary vegetation is appropriate where any disturbed areas of soil is to be left exposed for a period of thirty (30) days or more, but where further disturbance or construction activity is planned for a later time.

Following selection of site revegetation measures, the erosion and sediment control plan should show:

- Location of areas in which temporary and permanent revegetation is to be employed;
- Location and details of specialised revegetation or stabilising methods to be employed;
- Details of types and rates of planting materials, fertilisers and/or mulches to be used in revegetation;
- Details regarding the scheduling of proposed measures;
- Details regarding the maintenance of proposed revegetation measures.

POTENTIAL ISSUES	SITE ISSUES	MITIGATION
Waste	Low Risk. General daily waste.	All waste will be disposed of in the appropriate manner.
Storm Water	Possible Erosion	A regular maintenance schedule on roads and bund walls. No water course will be disturbed. Evacuate during floods.
Fire	Low Risk. Machinery or grass fire.	Area will be close to the river and on cleared land. In the event of a machine catching fire a Fire Extinguisher is located on every machine.
Weeds	With the amount of water there is a likelihood of weed growth.	A regular weed control spray will be used.
Dust	Will be created by Trucks in dry times	Water Trucks will be used on roads. Onsite speed limits will be 15km/hr and enforced

Noise	Machinery Noise	Site 1km from property residence. All vehicle and machinery are well maintained and any noise defects will be repaired immediately.
Spills	Low risk only spillage risk would be during refuelling of machinery.	In the event of a spillage. The contaminated area will be collected and disposed of in the appropriate way.
Evacuation/flooding	Site is in a flood prone area	Site will be left totally clear of all containers, temporary buildings and machinery.
Fuel Storage	Limited to fuel and oil in plant and equipment in tanks and sumps of machinery.	Fuel and oils delivered by company service vehicle as needed.
Flooding	Major floods occur rarely	In the event of a flood, Site will be evacuated and left totally clear of all containers, temporary buildings and machinery.
Visual Values	Possible complaints from Passers by & Adjacent Landholders regarding anything unsightly	The Project Manager will ensure that the visual amenity of adjacent landowners will be considered at all stages of the work under the contract by keeping the site neat and tidy.

22. APPENDICES:

1. Environmental Incident Report Form
2. Definitions of Environmental Harm
3. Site Maps
4. Plans of the method of extraction
5. Diagram of sand washing procedures

6. CQ Soil test results

Environmental Incident Report:

Issued: / /10

Project Number: _____ **Date: / /** **Time: : am/pm**

Project Name: _____ **Project Location:** _____

Incident Location: _____ _____

Incident Type: _____

Type	Level		Type	Level	(See appendix definition of environmental harm for the level of the Incident)
		Administrative			Flora and/or Fauna
		Storage & Handling of Hazardous Goods and Fuels			Erosion and/or Sedimentation
		Water Pollution			Vibration
		Noise			Land Contamination
		Air Quality, Dust & Vehicle Emissions			Damage to Heritage Value
		Waste Management			

Other - Please Specify: _____

Description of Incident: _____

_____

_____

_____

Reported by: _____ **Reported to:** _____

Date & Time Environmental Officer Notified: _____ _____ **am / pm**

The above section is to be completed by the person who identified the issue

Reported to EPA (if applicable) at: _____ by: _____ on: _____

Remedial Action Taken: _____

_____

_____

Person Responsible for Remedial Action: _____

Proposed Preventative Action: _____

_____

_____

Cost of Remedial Action: $ _____ Report prepared by: _____

Signature: _____ _____ Date: / /

DEFINITION OF ENVIRONMENTAL HARM

Environmental Harm

Any adverse impact, or potential adverse effect (temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance. (S14. (1)).

NON-COMPLIANCE REPORTING LEVELS		
Level	**Equivalent Environmental Protection Act (1994)**	**Context**
Level 1a	Not Applicable	**Minor Administrative Breach** - Issues involving minor non-conformance with no environmental harm. Example: • The late submission of a report • Shortfall in environmental training • No pollution control equipment on site • Incorrect storage of chemicals/fuels on site (no bunding)
Level 1b	S39 & S40 (Environmental Authorities) or Contract Management Plan breach	**Major Administrative Breach** - Consistent or repeated non-adherence to technical issues involving environmental laws and regulations and Main Roads policy. Example: • Consistent late submission of a report • Failure to obtain a license/permit • Continued incorrect storage of chemicals & fuels • Continued non-conformance
Level 2a	**Environmental Nuisance** - unreasonable interference or likely interference with an environmental value caused by noise, dust, odour, light; or an unhealthy, offensive or unsightly condition because of contamination; or another way prescribed by regulation. (S15)	**Minor Environmental Nuisance** - non-conformance with limited environmental effect. Example: • Minor fuel/chemical spill with no connection to surface water (i.e. contained within building or depot) • Complaints regarding noise, dust, odour or light from road works
Level 2b		• Open burning of waste **Major Environmental Nuisance** - A recurrent issue or issues of a continuous nature but with limited environmental effect. Example: • Served with an infringement notice • More than two complaints regarding an environmental nuisance of a similar nature • Nuisance issue receives media attention

Level 3	**Material environmental harm** is environmental harm (other than environmental nuisance): • That is not trivial or negligible in nature, extent or context; or • That causes actual or potential loss or damage to property of an amount of, or amounts totaling, more than the $5,000 but less than the $50,000; or • That results in costs of more than the $5,000 but less than $50,000 being incurred in taking appropriate action to: • Prevent or minimize the harm; and • Rehabilitate or restore the environment to its condition before the harm. (S16)	Issues of a significant nature with medium-term effect. Examples: • High levels of sediment entering a stream from a road construction site • Chemical spill contaminating a small area of land • Fuel/chemical spill entering surface waters • Incorrect disposal of regulated waste • No sedimentation/erosion controls (potential harm) • Unauthorized clearing in a sensitive habitat area • Sedimentation pond waters entering surface waters
Level 4	**Serious environmental harm** is environmental harm (other than environmental nuisance): • That causes actual or potential harm to environmental values that is irreversible, of a high impact or widespread; or • That causes actual or potential harm to environmental values of an area of high conservation value or special significance; or • That causes actual or potential loss or damage to property of an amount of, or amounts totaling, more than $50,000; or • That results in costs of more than $50,000 being incurred in taking appropriate action to: • Prevent or minimize the harm; and • Rehabilitate or restore the environment to its condition before the harm. (S17)	Major issues with potentially serious environmental consequences and long-term impact. Example: • Exposure of acid sulphate soils polluting a waterway resulting in significant fish kill • Major fuel spill contaminating land • Major fuel spill contaminating water • Unauthorized clearing within Wet Tropics • Incorrect disposal of wastes in an environmentally sensitive area • High levels of sediment entering a stream from a road construction site • Incorrect disposal of regulated waste • No sedimentation/erosion controls (potential harm) • Unauthorized clearing in a sensitive habitat area • Sedimentation pond waters entering surface waters

future-plus ENVIRONMENTAL

Preliminary Acid Sulfate Soil Investigation
Proposed Sand Extractive Industry

Mr Paul Waardyk

Nine Mile Road, Fairy Bower

August 2010

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1.0 INTRODUCTION

1.1 BACKGROUND

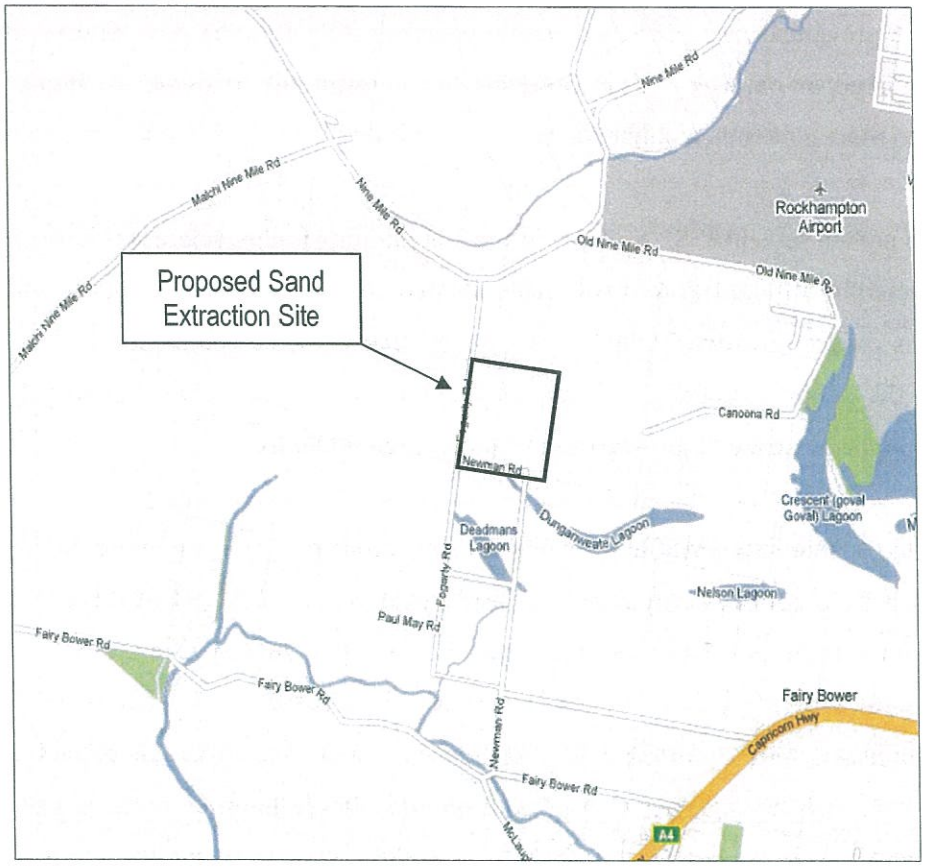
A preliminary Acid Sulfate Soil Investigation has been undertaken on behalf of Paul Waardyk as part of a proposed extractive industry site. This report aims to determine the potential for Acid Sulfate Soils (ASS) to be disturbed as a result of the proposed staged sand extraction to a depth of approximately 10m below current existing surface levels. The site is described as Lot 431 and Lot 432 on LIV401245, Nine Mile Road, Fairy Bower.

The development is estimated to involve the excavation of approximately 20,000 tonnes of soil per development Stage (likely to be in two (2) Stages) to a maximum depth of 10m (depending on the recovery of suitable sands).

Developments in Queensland are subject to investigations of ASS in accordance with the *State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils (SPP2/02),* when excavation of more than $100m^3$ of soil or sediment '*at or below 5 metres Australian Height Datum (AHD) where natural ground level is less than 20 metres AHD*' is proposed. This investigation is considered a preliminary field based assessment and therefore the sampling densities and intensities are less than those identified in the Guidelines. Additional sampling would be necessary in order to fully comply with the Guidelines.

A Site Locality Plan is included as Figure 1 and a Site Layout Plan as Figure 2. A Borehole Location Sampling Plan has been included as Figure 3.

Figure 1: **Site Locality Plan**



Source: Google Maps 2010

1.2 ACID SULFATE SOILS

Acid Sulphate Soil's (ASS) are soils which contain iron pyrites. The pyrites oxidise when exposed to oxygen, and when combined with water form sulphuric acid. This normally occurs when soils experience a change in ambient conditions from anaerobic to aerobic states. The sulphuric acid has the potential at this time to leach out of the soil and lower the pH of receiving waters. In addition to this, the contaminated water may increase the heavy metal concentration of the receiving waters (increasing toxicity levels by allowing iron and aluminium to 'fall out') and reduce the neutralising and buffering capacity of the receiving waters. The result of this is the degradation of environmental conditions. The lowering of pH can also have social and economic costs such as seriously affecting building materials and structures, and the reduction of public amenity and safety.

ASS can either be defined as actual or potential. Actual ASS (AASS) are those soils which have previously been oxidised, while potential ASS (PASS) pose limited threat unless disturbed or oxidised. The following are descriptions of these, as defined by Queensland State government authorities:

Actual acid sulfate soils (AASS): Soil or sediment containing highly acidic soil horizons or layers affected by the oxidation of soil materials that are rich in iron sulphides, primarily pyrite. This oxidation produces hydrogen ions in excess of the sediment's capacity to neutralize the acidity, resulting in soils of pH 4 or less. These soils can usually be identified by the presence of jarosite (a yellow coloured mineral).

Potential acid sulfate soils (PASS): Soils or sediments containing iron sulphides or sulfidic material that have not been exposed to air and oxidised. The field pH of these soils in their undisturbed state is pH 4 or more, and may be neutral or slightly alkaline.

Projects involving the disturbance of ASS must assess the risks associated with disturbance through the consideration of both on and off-site impacts. A thorough ASS investigation (in compliance with the *Sampling Guidelines*) is an essential component of risk assessment. Such an investigation is needed to provide information on the environmental setting, location of and depth to ASS, existing and potential acidity present in the soil, and soil characteristics. The results from the investigation determine the most appropriate management strategy for the site.

1.3 ACID SULFATE SOIL INVESTIGATIONS

The investigation must aim to include the following information and techniques where possible;

- The approximate location of each borehole;
- Description of the vertical dimensions of the borehole relative to surface AHD (where possible);
- A brief description of the equipment and/or methods used to retrieve the samples;
- A field description for each soil profile including soil texture, colour, mottling and other diagnostic features (e.g. jarosite, shell);

- Results from field soil tests (field pH (pH_F), pH after oxidation with hydrogen peroxide (pH_{FOX}) and reaction with peroxide at 0.25m vertical intervals to the base of the soil profile; and
- Collect samples at 0.25m intervals down the soil profile e.g. surface, 0–0.25m, 0.25–0.5m etc, ensuring each horizon is sampled. Samples collected to extend 1m past the deepest excavation point (where possible).

1.4 REPORT OBJECTIVES

This report seeks to address issues relating to ASS in general accordance with the *State Planning Policy 2/02 – Planning and Managing Development Involving Acid Sulfate Soils* and associated Guideline, and to demonstrate that the proposed development generally complies with these requirements. The report includes the following information:

- The outcomes of a desk-top study to determine the likelihood of ASS occurring on the subject land;
- A sampling methodology designed based on preliminary investigation to confirm the presence or absence of actual acid sulfate soils (AASS) and/or potential acid sulfate soils (PASS) on the subject land, including soil investigations and field testing.
- A summary and evaluation of the results of the sampling program, including recommendations for further testing; and
- Specific management requirements to be undertaken during construction.

The assessment has been conducted in general accordance with *State Planning Policy 2/02 – Planning and Managing Development Involving Acid Sulfate Soils* and associated Guideline, and the Department of Natural Resources & Mines' *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998 (QASSIT, 1998)*. It must be noted that more detailed soil profiling and sampling will be required to fully comply with the above guidelines.

This assessment was a preliminary investigation only and no laboratory testing has been included.

2.0 SITE DESCRIPTION

2.1 GENERAL

The proposed staged sand extractive industry site is located approximately 6.5km west of the township of Rockhampton on the eastern side of Fogarty Road and south of Nine Mile Road. Based on information provided by others, the proposed sand extractive site footprint for both Stage 1 and Stage 2 of the development is understood to be located in the northern portions of both Lot 431 and Lot 432. Rural properties lie to the north, east and south of the site while Fogarty Road lies adjacent the western boundary.

The site can be accessed via Fogarty Road, Fairy Bower through its western boundary.

All site based information has been supplied by the third parties as no site investigation was undertaken by FPE.

2.2 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.

Surface Hydrology

Any excess water is expected to migrate generally to the south toward the watercourse and associated dams located in the adjoining property to the south.

Groundwater

Groundwater was encountered onsite during soil investigation conducted by CQ Soil Testing. Groundwater was encountered at 7.8m and 7.7m at BH1 and BH2 respectively within a sand bearing layer which begins at 4m depth below surface.

2.3 VEGETATION

The majority of the proposed Stage 1 and Stage 2 development area has been previously cleared and the northern portion of the site generally consists of mixed grasses. The southern portion of the site also consists of mixed grasses but has a higher percentage of scattered trees and regrowth vegetation.

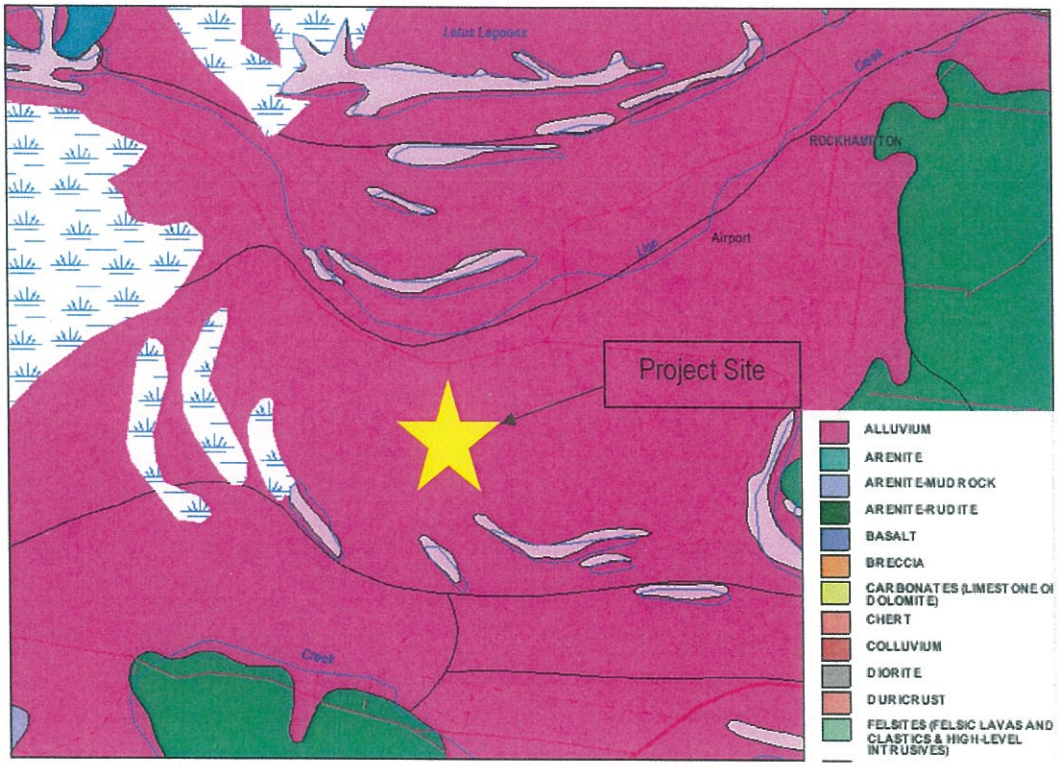
2.4 GEOLOGY

The geology for the general location has been identified as consisting of Alluvium. The descriptions of these geological units are described below in Table 1, with a mapping extract following Table 1:

Table 1: Department of Natural Resources & Water – *Interactive Resource and Tenure Maps Version 1.4*

Unit Name	Unit Type	Unit Age	Lithology Summary	Dominant Rock Type
Qa/1-Yarrol/Scag	Strata	QUATERNARY	Clay, silt, sand, gravel: intermediate terraces of Boyne and Fitzroy River flood plain alluvium	ALLUVIUM

Mapping Extract – Overview of Site and Surrounding Geology



2.5 SOILS

An investigation of the soil profile was conducted on site by CQ Soil Testing during works on the 29th July 2010. The soil profile logs were recorded at two (2) locations across the site. One (1) borehole was advanced in a central location of proposed Stage 1 (BH1) and one (1) borehole was advanced in a central location of proposed Stage 2 (BH2). A copy of the soil profile logs has been provided as Appendix A of this report.

BH1 was advanced to a depth of 8.1m while BH2 was advanced to a depth of 9.3m until refusal was met.

The results of the soil testing indicated that soils onsite generally comprise of high plasticity silty clay to 2.0m depth, overlying fine to coarse grained sandy clay to 3.0m depth, underlain by fine to coarse grained clayey sand to 4.0m depth. Soils below 4m consist of fine to coarse grained sand to borehole termination depth.

3.0 SAMPLING METHODOLOGY

3.1 GENERAL

At the location of BH1 and BH2 on the site, the drilling was attempted to 11m given that the likely maximum depth of disturbance at these points is estimated to be no more than 10m. Boreholes were however terminated at depths of 8.1m and 9.3m at BH1 and BH2 respectively due to refusal.

The total volume of proposed excavated material is understood to be in the order of ~20,000 tonnes/m^3 per Stage to a maximum depth of 10m (depending on the recovery of suitable sands). Given the scale of the development, a preliminary ASS investigation undertaken in general accordance with SPP 2/02 to determine whether the development will encounter or impact on any ASS. In accordance with the SPP 2/02 Guideline and the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland* (*QASSIT, 1998*), the extent of the borehole depths is considered to be of sufficient depth to identify potential disturbance of AASS or PASS or potentially existing acidic material on site.

Based on the estimated volume of material requiring disturbance, and the deep excavations proposed, it was determined that the potential to impact on any AASS or PASS material is considered to be moderate.

A preliminary site investigation and soil testing were undertaken by CQ Soil Testing Pty Ltd to gain a general understanding of sub-surface conditions and to confirm the outcomes of the desk-top study and preliminary site investigations.

3.2 SAMPLING LOCATIONS & METHODOLOGY

One (1) borehole to a maximum depth of 8.1m and one (1) borehole to a maximum depth of 9.3m below existing surface levels were advanced to generally satisfy the relevant requirements of the preliminary investigation. A combination of push tubing and 75mm solid flight auger was used to advance boreholes at the approximate locations shown in the Plan included as Figure 3 of this Report.

Soil samples were collected at 0.25m intervals for the full extent in all boreholes. A composite sample from 8.1 – 8.7m depth and 8.7 – 9.3m at BH2 was collected due to difficult recovery of sand material below the watertable.

3.3 FIELD PH TESTING

Field pH testing was undertaken for all samples collected. Testing included initial field pH tests (pH_F), after the addition of distilled water, to determine the presence of AASS, followed by field peroxide pH testing (pH_{FOX}) conducted after the addition of 30% hydrogen peroxide solution to test for sulfides or PASS.

- pH_F: A result of pH <4 indicates oxidation has occurred in the past and that AASS is present.
- pH_{FOX}: A result of pH <3, plus a pH_{FOX} reading >2 pH units below the pH_F, plus a strong reaction with peroxide, strongly indicates the presence of PASS.

The results of field pH testing were then compared to the relevant criteria for interpreting field test results specified in the above mentioned Guidelines to determine the presence of ASS. These criteria generally relate to the reaction of soils to hydrogen peroxide, the pH of soils after oxidation and the difference between pH before and after oxidation.

3.4 LABORATORY ANALYSIS

This is a preliminary ASS investigation only and no laboratory analysis has been included.

4.0 FIELD ANALYSIS

4.1 GENERAL

The results of the acid sulfate field tests, including reaction responses to hydrogen peroxide, field pH and pH results following oxidation have been provided in Table 2.

The results of the preliminary field tests were used to help determine the potential for AASS or PASS. It is important to note that whilst a useful exploratory tool, soil field pH tests are indicative only and cannot be used as a substitute for laboratory analysis to determine the presence of ASS. Laboratory analysis is needed to quantify the amount of existing plus potential acidity.

Samples were submitted to Future-Plus Environmental for testing in general accordance with the QASSIT Guidelines for acid sulphate field tests. All samples taken were preserved and sent for analysis within the applicable holding times.

5.0 RESULTS

5.1 PH_{FIELD} AND PH_{FOX} RESULTS

The results of the field testing have been shown below in Table 2.

Table 2: Results of Field pH_F and pH_{FOX} Analysis Including Field Based Assumptions

					Field Testing Assumptions		
Location	pH F	pH_{FOX}	Change	Reaction	Is Material AASS? (<4pH)	Is Material considered PASS? (<3pH_{FOX})	Is Reaction >2pH?
BH1 0.00-0.25	4.91	3.05	1.86	XX	No	No	No
BH1 0.25-0.50	6.35	6.20	0.15	XXXX	No	No	No
BH1 0.50-0.75	7.22	7.37	-0.15	XXXX	No	No	No
BH1 0.75-1.00	7.20	7.41	-0.21	XX	No	No	No
BH1 1.00-1.25	7.05	7.34	-0.29	XXXX	No	No	No
BH1 1.25-1.50	7.22	7.83	-0.61	XX	No	No	No
BH1 1.50-1.75	7.31	8.11	-0.80	XXXX	No	No	No
BH1 1.75-2.00	7.52	7.77	-0.25	XXX	No	No	No
BH1 2.00-2.25	7.64	7.81	-0.17	XXX	No	No	No
BH1 2.25-2.50	7.55	7.26	0.29	XX	No	No	No
BH1 2.50-2.75	7.52	7.15	0.37	X	No	No	No
BH1 2.75-3.00	7.51	7.55	-0.04	XXX	No	No	No
BH1 3.00-3.25	7.78	6.45	1.33	X	No	No	No
BH1 3.25-3.50	7.69	5.85	1.84	X	No	No	No
BH1 3.50-3.75	7.55	7.22	0.33	-	No	No	No
BH1 3.75-4.00	7.64	7.66	-0.02	XX	No	No	No
BH1 4.00-4.25	7.76	7.83	-0.07	XXX	No	No	No
BH1 4.25-4.50	7.65	7.51	0.14	XX	No	No	No
BH1 4.50-4.75	7.62	7.65	-0.03	X	No	No	No
BH1 4.75-5.00	7.69	5.88	1.81	-	No	No	No
BH1 5.00-5.25	7.65	5.66	1.99	-	No	No	No
BH1 5.25-5.50	7.19	5.83	1.36	X	No	No	No
BH1 5.50-5.75	7.35	6.16	1.19	-	No	No	No
BH1 5.75-6.00	7.40	7.92	-0.52	XX	No	No	No
BH1 6.00-6.25	7.48	8.00	-0.52	XX	No	No	No
BH1 6.25-6.50	7.69	8.22	-0.53	XX	No	No	No
BH1 6.50-6.75	7.72	6.81	0.91	X	No	No	No
BH1 6.75-7.00	7.88	8.18	-0.30	XX	No	No	No
BH1 7.00-7.25	8.09	8.19	-0.10	XX	No	No	No
BH1 7.25-7.50	7.69	8.10	-0.41	XX	No	No	No
BH1 7.50-7.75	8.03	8.15	-0.12	XX	No	No	No
BH1 7.75-8.10	7.71	8.14	-0.43	XX	No	No	No
BH2 0.00-0.25	5.40	3.50	1.90	XX	No	No	No
BH2 0.25-0.50	7.25	6.75	0.50	XX	No	No	No
BH2 0.50-0.75	7.49	7.05	0.44	XX	No	No	No

Location	pH F	pH_{FOX}	Change	Reaction	Field Testing Assumptions: Is Material AASS? (<4pH)	Is Material considered PASS? (<3pH_{FOX})	Is Reaction >2pH?
BH2 0.75-1.00	7.46	7.77	-0.31	XX	No	No	No
BH2 1.00-1.25	7.43	7.37	0.06	X	No	No	No
BH2 1.25-1.50	7.39	7.58	-0.19	XX	No	No	No
BH2 1.50-1.75	7.45	7.72	-0.27	XXX	No	No	No
BH2 1.75-2.00	7.58	8.12	-0.54	XXX	No	No	No
BH2 2.00-2.25	7.71	7.06	0.65	-	No	No	No
BH2 2.25-2.50	7.69	7.39	0.30	X	No	No	No
BH2 2.50-2.75	7.67	7.50	0.17	X	No	No	No
BH2 2.75-3.00	7.77	7.05	0.72	X	No	No	No
BH2 3.00-3.25	7.87	8.06	-0.19	XX	No	No	No
BH2 3.25-3.50	7.91	7.92	-0.01	XX	No	No	No
BH2 3.50-3.75	8.15	8.24	-0.09	X	No	No	No
BH2 3.75-4.00	8.17	6.67	1.50	X	No	No	No
BH2 4.00-4.25	7.78	7.39	0.39	X	No	No	No
BH2 4.25-4.50	7.85	8.10	-0.25	X	No	No	No
BH2 4.50-4.75	7.98	6.91	1.07	X	No	No	No
BH2 4.75-5.00	7.94	6.37	1.57	X	No	No	No
BH2 5.00-5.25	7.93	6.10	1.83	X	No	No	No
BH2 5.25-5.50	7.79	6.40	1.39	X	No	No	No
BH2 5.50-5.75	7.95	6.89	1.06	X	No	No	No
BH2 5.75-6.00	7.52	6.81	0.71	X	No	No	No
BH2 6.00-6.25	7.79	8.10	-0.31	X	No	No	No
BH2 6.25-6.50	7.92	8.20	-0.28	X	No	No	No
BH2 6.50-6.75	7.98	8.34	-0.36	XX	No	No	No
BH2 6.75-7.00	7.77	7.41	0.36	X	No	No	No
BH2 7.00-7.25	7.99	7.56	0.43	X	No	No	No
BH2 7.25-7.50	7.60	8.03	-0.43	XX	No	No	No
BH2 7.50-7.75	7.95	8.38	-0.43	XX	No	No	No
BH2 7.75-8.10	7.72	8.28	-0.56	XX	No	No	No
BH2 8.10-8.70	7.30	7.47	-0.17	X	No	No	No
BH2 8.70-9.30	7.42	6.81	0.61	X	No	No	No

- No Reaction
x Slight Reaction
xx Moderate Reaction
xxx High Reaction
xxxx Very vigorous reaction, gas produced and heat generated commonly >80°C

The field test pH_F results were all above pH 4 (pH 4.91 – 8.17) indicating the absence of Actual Acid Sulfate Soil (AASS).

Within the site locations, a minimum pH_F value of 4.91 and maximum of 8.17 was detected. This gives a range of 3.26 pH units and an average pH_F of 7.56 over all 66 samples.

In relation to the field test pH_{FOX} results all of the 66 samples were found to have a pH above the pH 3 trigger value. The lowest pH_{FOX} result of 3.05 was noted to occur in BH1 (0.00- 0.25m) in surface soils. All samples displayed a drop of <2 pH units.

It was noted that the majority of samples were shown to experience a reaction during testing with high to very vigorous reactions experienced at upper depths of 0.0m – 4.50m at BH1 and moderate to high reactions at upper depths of 0.0m – 2.0m at BH2. In this situation it is likely that the high to very vigorous reactions noted in the upper soil profile are attributable to a combination of organic matter or other soil constituents such as manganese oxides rather than sulphide.

Of all the 66 samples tested within the scope of these works none were found to trigger either of the field based criteria for determination of likely presence of AASS or PASS.

Interpretation of the field test results suggest that the presence of AASS or PASS or soil types which may pose a risk of acid generation is unlikely. Further laboratory analysis for S_{CR} methodology (Reducible Chromium method) or SPOCAS would be required to more conclusively determine the presence of ASS.

Based on the investigation results it would be prudent to recommend that further testing will be necessary. Any future investigations must be conducted in strict accordance with the *State Planning Policy 2/02 – Planning and Managing Development Involving Acid Sulfate Soils* and associated Guideline, the Department of Natural Resources & Mines' *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998 (QASSIT, 1998)*, and *Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines (DNRM 2002).*

6.0 CONCLUSIONS

6.1 GENERAL

This report was commissioned in order to provide a preliminary assessment of the potential disturbance of ASS at the subject site. Given the preliminary nature of the investigations, the field based assessment was carried out at a sampling intensity less than that which is recommended in the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland* (QASSIT, 1998) and SPP 2/02 Guidelines.

Based on the results of the preliminary investigations discussed in this report the presence of ASS in vicinity of BH1 and BH2 is unlikely. However without more intensive field investigations and further laboratory analysis using S_{CR} or SPOCAS we are not able to conclusively determine the presence of AASS or PASS and whether treatment and management of these soils is necessary.

Depths of preliminary investigations were limited to a depth of 8.1m and 9.3m (BH1 and BH2 respectively due to auger refusal. Depths of proposed excavations are not expected to exceed beyond these depths due to potentially unsuitable material for extraction.

6.2 INVESTIGATIONS AND ANALYSIS RESULTS

Field tests were undertaken to determine the reactivity of soils and the presence of AASS and PASS. These were undertaken at 0.25m intervals to 8.1m depth (maximum) at BH1 and 9.3m depth (maximum) at BH2 with a total of sixty six (66) samples collected. The field test pH_F results were all above pH 4 therefore the soils were not considered to constitute AASS.

Peroxide pH_{FOX} results showed all of the sixty six (66) samples were found to have a pH above the pH 3 trigger value. The presence of high to very vigorous reactions experienced at upper depths of BH1 and moderate to high reactions at upper depths of BH2 is likely to be attributed to a combination of organic matter or other soil constituents such as manganese oxides rather than sulphide.

Of all the 66 samples tested within the scope of these works none were found to trigger either of the field based criteria for determination of likely presence of AASS or PASS.

Based on the preliminary field results, it was determined that the soils appeared to be non ASS, however further confirmatory laboratory tests would be required to conclusively verify the presence of any AASS or PASS.

To confirm or deny the presence of AASS or PASS a representative selection of samples at 0.5m intervals from the boreholes would be submitted for further laboratory testing (S_{CR} or SPOCAS testing). On the basis of these preliminary field based test results only the soil is not considered ASS.

FIGURE 1

SITE LOCALITY PLAN - REFER PAGE 5

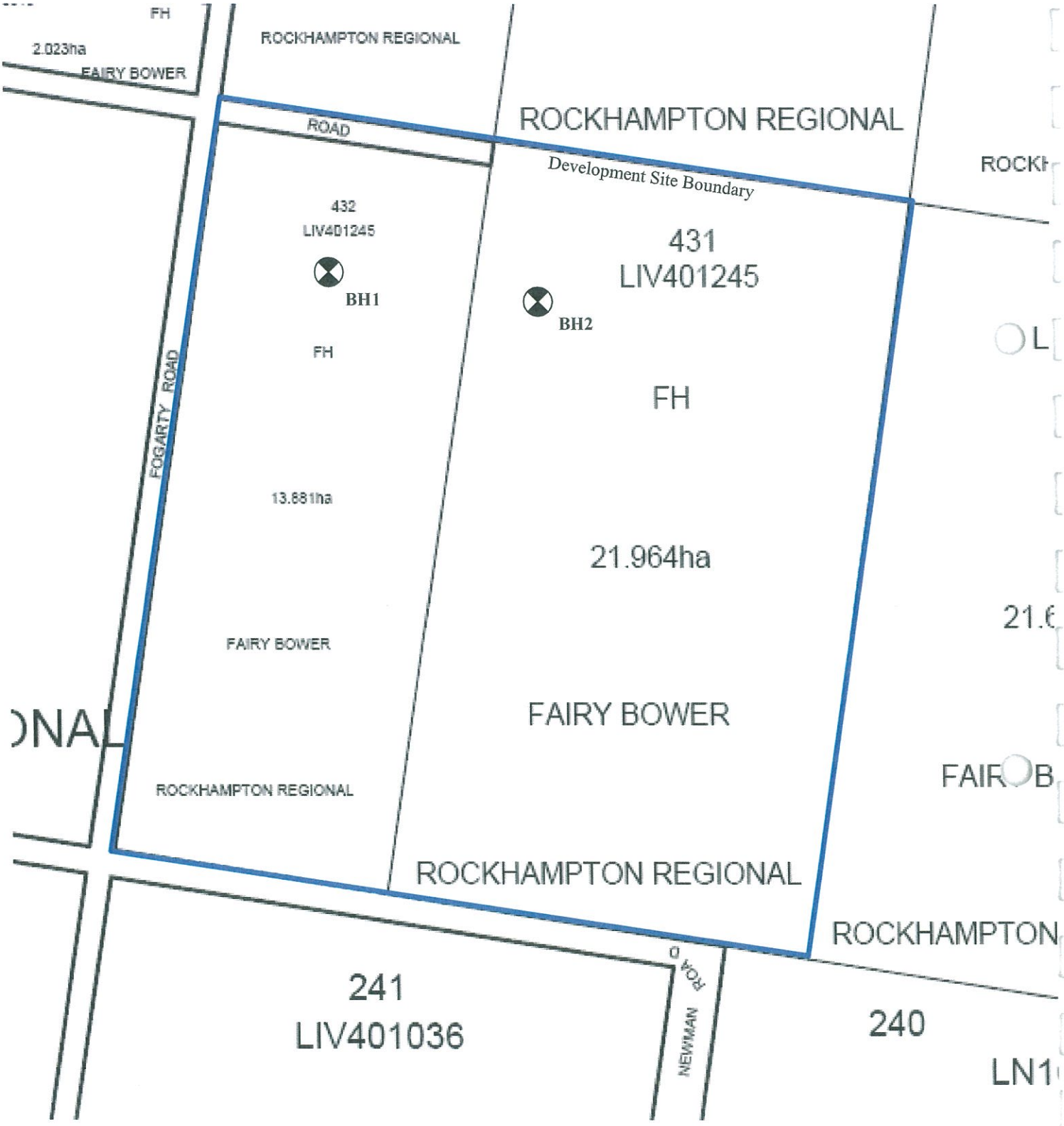
FIGURE 2

PROPOSED SITE LAYOUT PLAN

To be Inserted When Made Available

FIGURE 3

BOREHOLE AND SAMPLE LOCATIONS PLAN



fpe future-plus ENVIRONMENTAL	BOREHOLE LOCATION PLAN	Scales: Not To Scale
	Site: Lot 431 and 432 Nine Mile Rd, Fairy Bower	*Figure Measurements To Take Precedence Over Scale Measurements*
FPE Reference Number: 3798-100810-1.0	Client: Paul Waardyk	

APPENDIX A

SOIL PROFILE LOGS – CQ SOIL TESTING

CQ SOIL TESTING

SCAAMIA HOLDINGS P/L T/A CQ Soil Testing

Servicing all of Central Queensland

ABN - 47715943484 BSA License No - 1117681

Phone: (07) 49361163

Fax: (07) 49361162

info@cqsoiltesting.com.au

SOILS INVESTIGATION

CLIENT: P Waardyk

SITE ADDRESS: Lot 432 and Lot 431 (LIV401245)
Nine Mile Road, Fairy Bower

JOB NUMBER: CQ5431

ISSUE DATE: 4th August 2010

FIELD INVESTIGATION LOG

VISUAL SOIL CLASSIFICATION TO AS 1726 - 1993

SITE ADDRESS -Lot 250 Nine Mile Road, Fairy Bower

Job Number CQ3555 29/07/2010

CQ SOIL TESTING

BOREHOLE 1 (DIRECT PUSH BH1)
Lot 432 on LIV401245

Depth (m)	Visual Class'n Symbol	Visual Description of Material Name,particle characteristics,plasticity,secondary components,colour,structure	Estimated Moisture Condition	Estimated Consistency or Rel/Density
0.0 2.0	CH	Silty CLAY, high plasticity, trace of fine to coarse grained sand, dark grey.	M	VST
2.0 3.0	CI	Sandy CLAY, medium plasticity, fine to coarse grained, brown.	M	VST
3.0 4.0	SC	Clayey SAND, fine to coarse grained, low plasticity fines, yellowish brown.	M	D
4.0 8.1	SP	SAND, fine to coarse grained, yellowish brown to brown with depth. **Watertable encountered at 7.8m**	M	D
Borehole terminated at 8.1 m				

LEGEND

MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	Remark
D – Dry	VS – Very Soft	VL – Very Loose	
M – Moist	S – Soft	L – Loose	
W – Wet	F – Firm	MD – Med Dense	
	ST – Stiff	D – Dense	
	V/ST – Very Stiff	VD – Very Dense	
	H – Hard		

FIELD INVESTIGATION LOG

VISUAL SOIL CLASSIFICATION TO AS 1726 - 1993

SITE ADDRESS -Lot 250 Nine Mile Road, Fairy Bower

Job Number CQ3555 29/07/2010

CQ SOIL TESTING

BOREHOLE 2 (DIRECT PUSH BH2)
Lot 431 on LIV401245

Depth (m)	Visual Class'n Symbol	Visual Description of Material Name,particle characteristics,plasticity,secondary components,colour,structure	Estimated Moisture Condition	Estimated Consistency or Rel/Density
0.0 2.0	CH	Silty CLAY, high plasticity, trace of fine to coarse grained sand, dark grey.	M	VST
2.0 3.0	CI	Sandy CLAY, medium plasticity, fine to coarse grained, brown.	M	VST
3.0 4.0	SC	Clayey SAND, fine to coarse grained, low plasticity fines, yellowish brown.	M	D
4.0 9.3	SP	SAND, fine to coarse grained, yellowish brown to brown with depth. **Watertable encountered at 7.7m**	M	D
Borehole terminated at 9.3 m				

LEGEND

MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	Remark
D – Dry	VS – Very Soft	VL – Very Loose	
M – Moist	S – Soft	L – Loose	
W – Wet	F – Firm	MD – Med Dense	
	ST – Stiff	D – Dense	
	V/ST – Very Stiff	VD – Very Dense	
	H – Hard		

ROCKHAMPTON REGIONAL COUNCIL
These plans are approved subject to the current conditions of approval associated with Development Permit No. D/278-2013
Dated 05-02-14

15 May 2013

Our Ref: 026-10-11
Your Ref: TMR11-000846

Department of Transport and Main Roads
PO Box 5096
Red Hill, Rockhampton Q 4701

McMurtrie consulting engineers

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

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

ABN 69 958 286 371

Att: Chris Murphy
Re: Traffic Engineering Assessment of Proposed Material Change of Use (Extractive Industry – Sand Quarry) - Extraction Industry Threshold Limit Increase (100,000t to 200,000t) at Lot 432 on LIV401245 on Fogarty Road, Fairy Bower

McMurtrie Consulting Engineers (MCE) has endeavored to work closely with the Department of Transport and Main Roads (DTMR). Several discussions regarding the proposed development were held with TMR Officer Mr. Chris Murphy, including a preliminary traffic evaluation, emailed to the Department (12.04.2013) at their request (see Appendix A). As noted in these discussions this development is merely an expansion of the existing approval. Following protracted pre-lodgment negotiations we would appreciate a timely response to the following assessment:

Dear Chris,

McMurtrie Consulting Engineers (MCE) have been engaged by the Applicant (Mr Paul Waardyk of Hardcore Performance Pty Ltd) 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) and a Local Government Roads (LGR) Traffic Engineering Assessment.

Background
Hardcore Performance Pty Ltd is currently operating under an existing Extractive Industry approval for 100,000t (see Appendix B for approval D/394-2011). Our Applicant seeks to increase his quarry operation by a further 100,000t based on market research that has identified supply opportunities in Yeppoon and Gladstone.

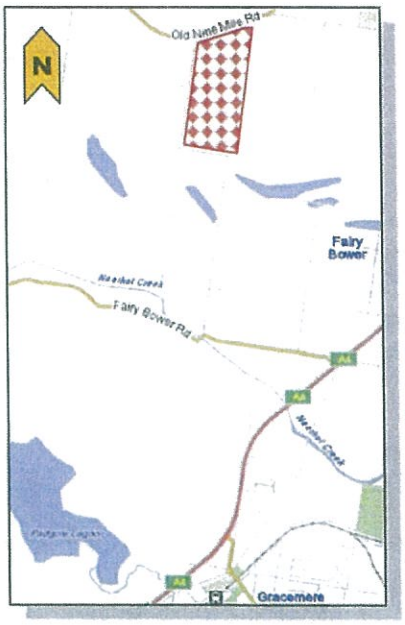
Development Profile
The intent is that the existing processing facility on Lot 432 on LIV401245 (owned by the Applicant) will provide the extra 100,000t required.

The screened sand will be stockpiled onsite (Lot 432 on LIV401245) and collected by customer arranged transport to various sites as demand dictates.

The venture will continue to supply to the following three (3) major companies in the North Rockhampton area as per the original approval:

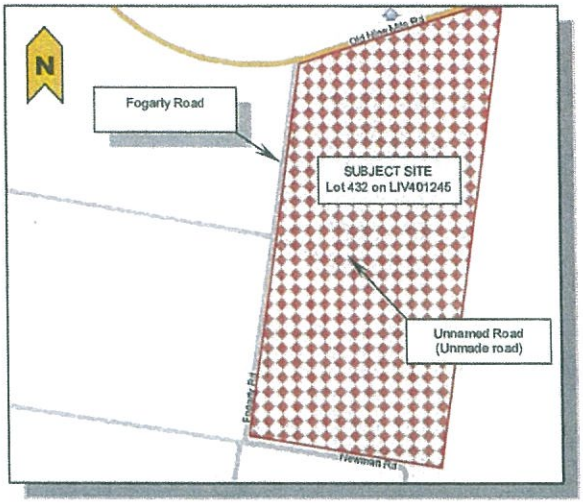
- Holcim (Australia), Concrete Plant at Knight Street
- Tandy Concrete, Pre-cast & Concrete Plant at Williamson Street
- Holcim (Australia), Pre-Cast Plant at McLaughlin Street

Deliveries to and from the processing facility will continue to 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



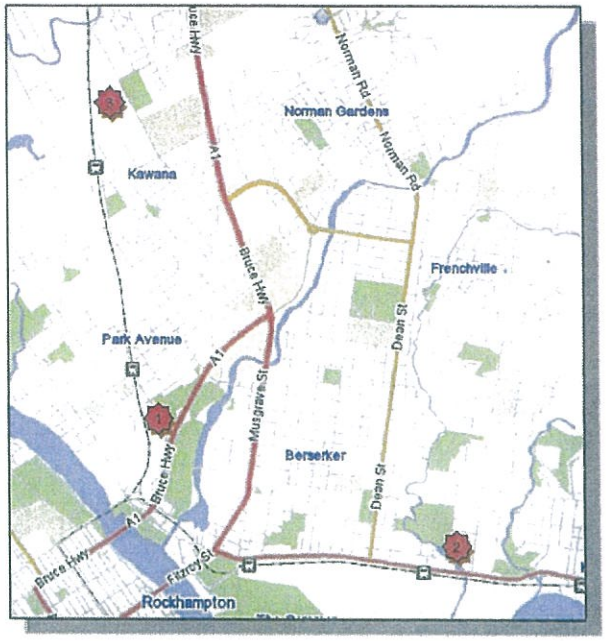
Proposed Transport Route – SCR and LGR Networks

As previously approved, from the processing facility, delivery vehicles will utilize the ring road arrangement (refer Appendix G 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.

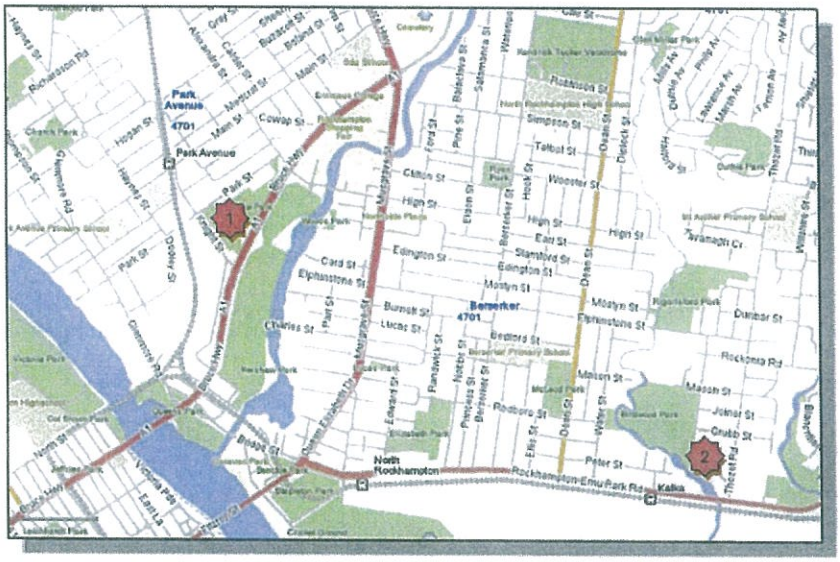
Fogarty Road, from Nine Mile Road to the site has been constructed to a gravel pavement (8m wide formation), by the property owner under agreement/permit with RRC.

As mentioned, the development will continue to deliver to 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.

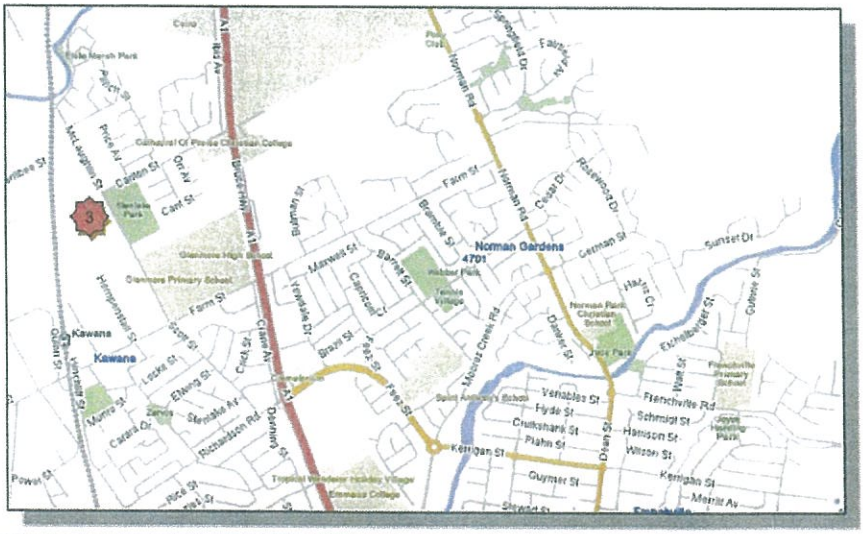


◄ Figure 3:
Proposed delivery Sites 1, 2 and 3.



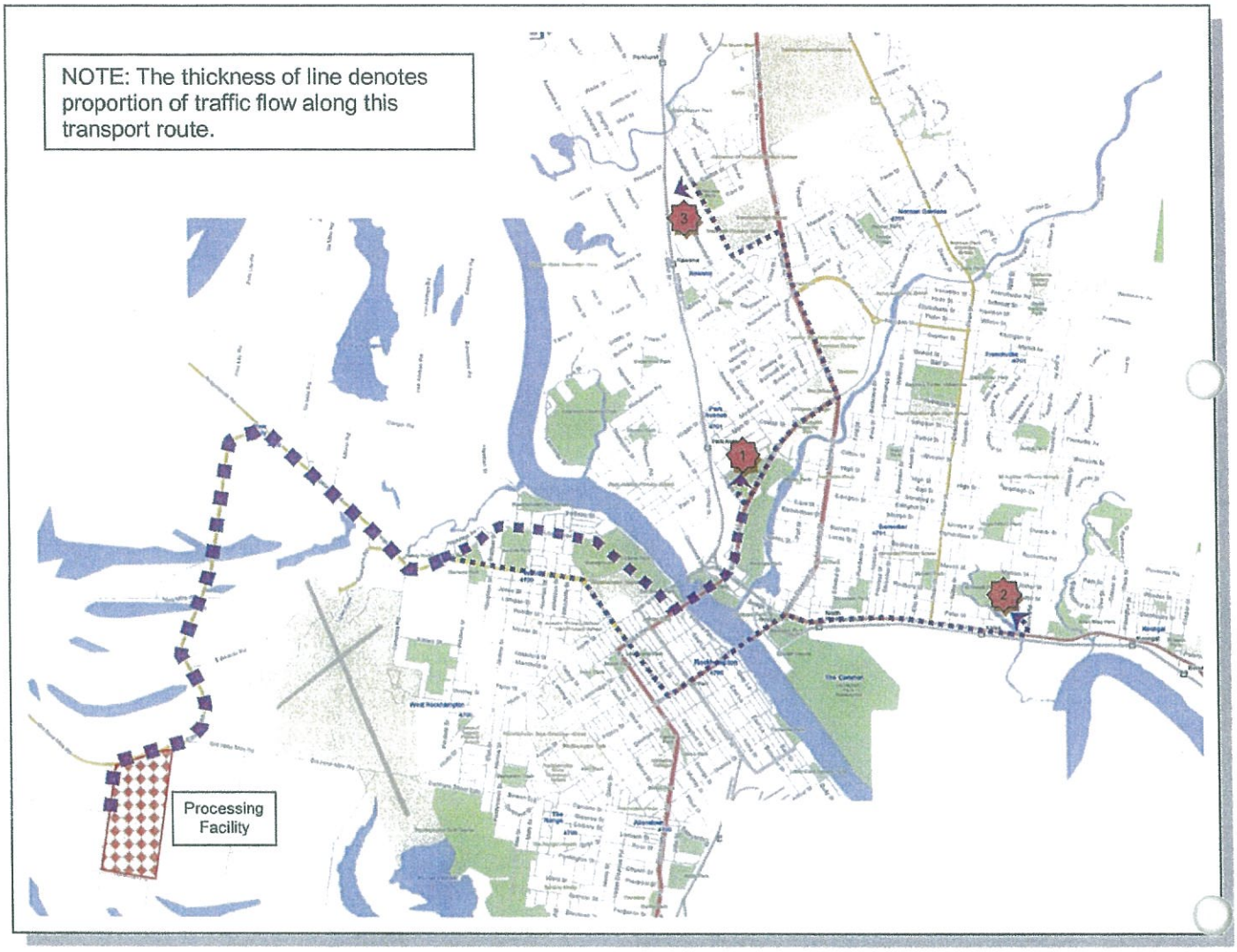
◄ Figure 4:
Proposed delivery Sites 1 and 2.

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

Development Increase Profile

The increased product is targeted at two (2) major companies, with the following expected market demand (pre-negotiated client arrangements indicate as such):

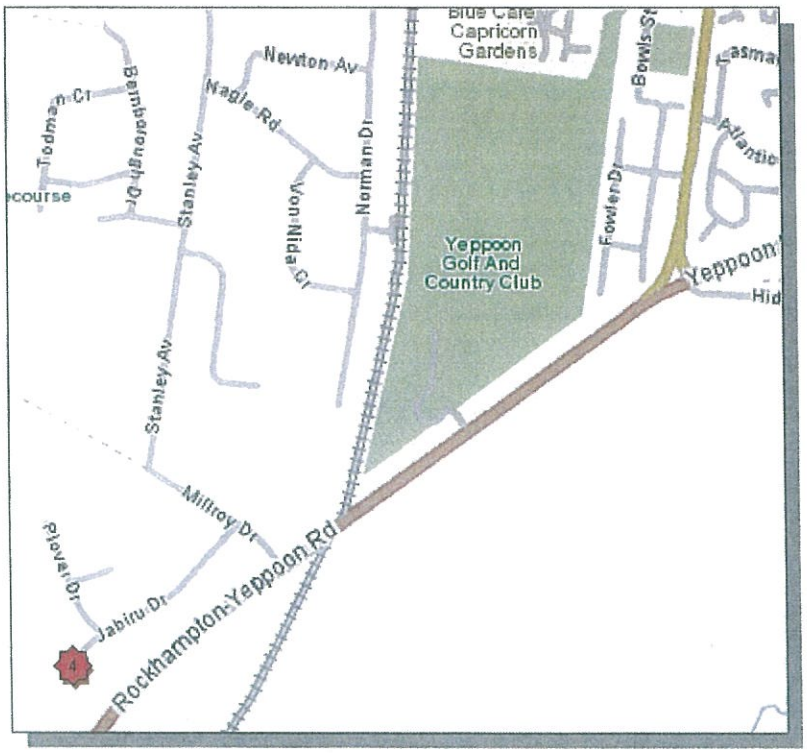
- Holcim (Australia), Jabiru Drive, Yeppoon - 20,000t per year
- Hansen Concrete Plants, Morgan St, Gladstone – 80,000t per year

Proposed Transport Route – SCR and LGR Networks

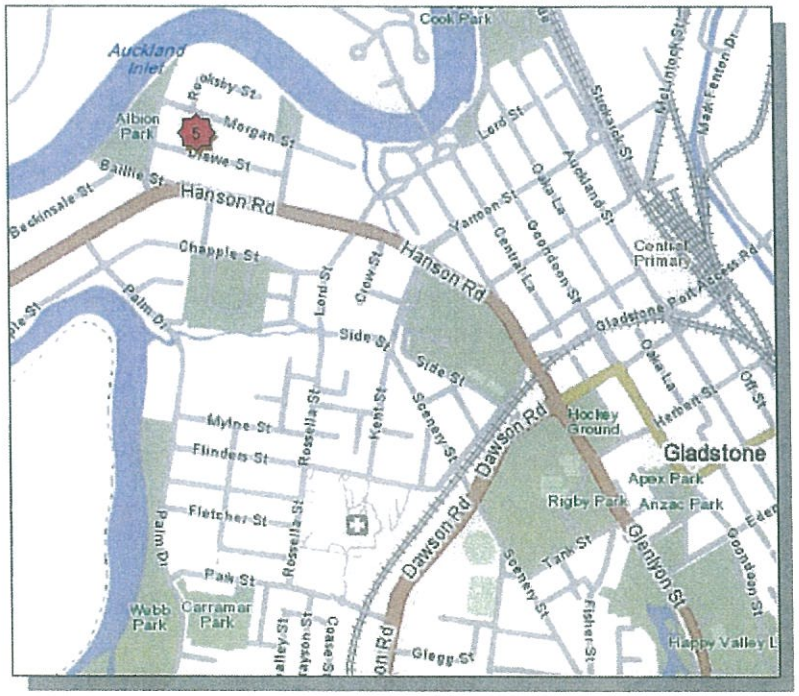
Delivery vehicles will utilize the ring road arrangement (refer Appendix G for Site Layout Plan) to access onto Fogarty Road. Trucks will then use the Nine Mile Road network to traverse over to Ridgelands Road and into the Rockhampton (Wandal) area.

As mentioned, the increased development will focus on 2 major companies in the Central Queensland area; these additional sites are located in the figures below:

4. Holcim (Australia), Jabiru Drive, Yeppoon
5. Hansen Concrete Plants, Morgan St, Gladstone



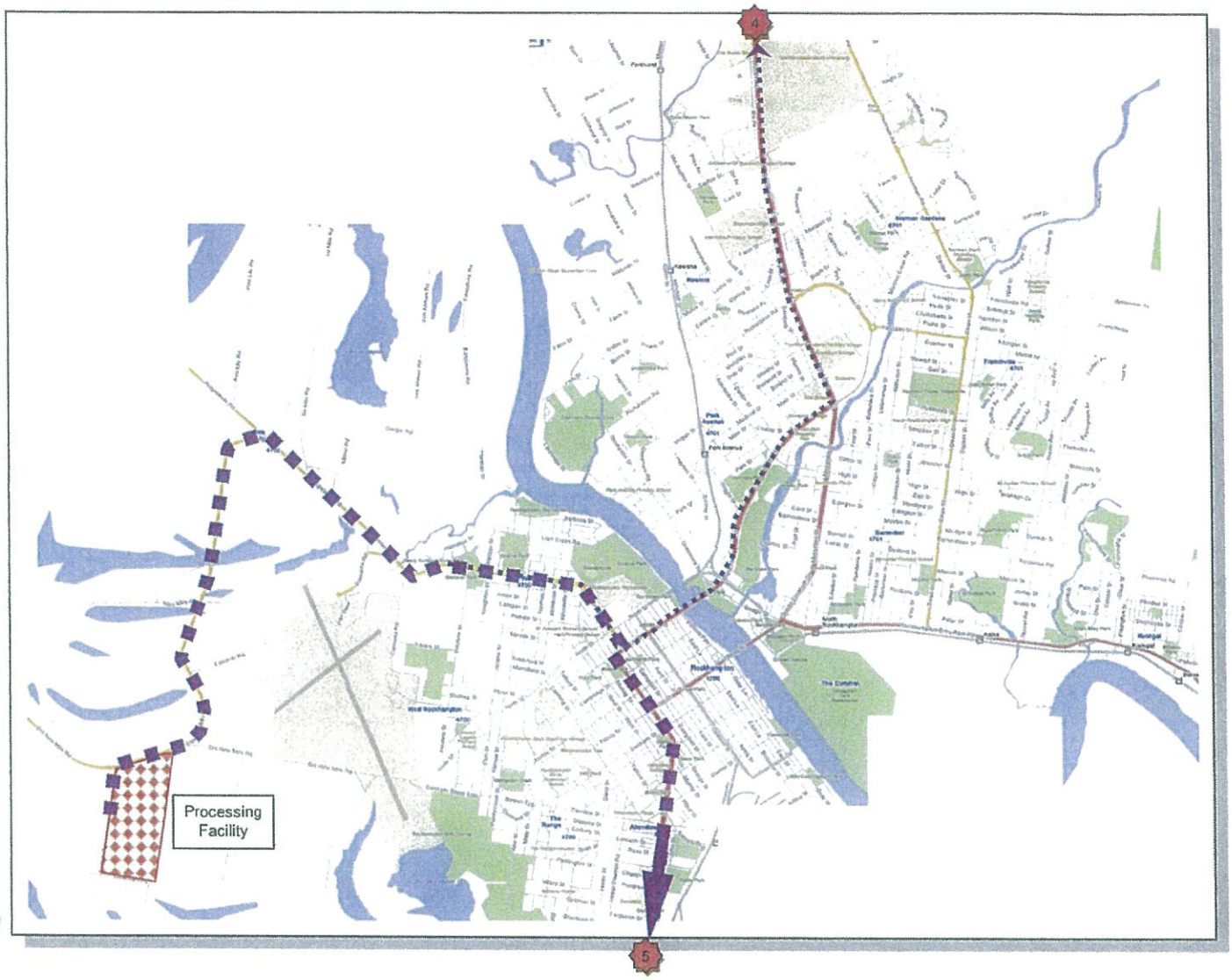
◄ Figure 3:
Proposed delivery Site 4



◄ Figure 4:
Proposed delivery Site 5

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 4 and 5.

Site 4. Holcim, Jabiru Drive, Yeppoon:

- Fogarty Road (LGR)
- Nine Mile Road (LGR)
- Rockhampton – Ridgelands Road (SCR)
- Lion Creek Road (LGR)
- Exhibition Road (LGR)
- Bolsover Street (LGR)
- Bruce Highway (SCR)
- Yeppoon Road (SCR)
- Millroy Drive (LGR)
- Jabiru Drive (LGR)

Site 5. Hansen Concrete Plants, Morgan St, Gladstone:

- Fogarty Road (LGR)
- Nine Mile Road (LGR)
- Rockhampton – Ridgelands Road (SCR)
- Campbell St (LGR)
- Albert St (SCR)
- George St (SCR)
- Bruce Hwy (SCR)
- Gladstone Mt Larcom Rd (SCR)
- Port Curtis Way (SCR)
- Hanson Rd (SCR)
- Kingdon St (LGR)
- Morgan St (LGR)

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 our meeting dated 09/09/2010. (And subsequent RFI response dated 16 April 2012).

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.

The pavement impact assessment will be based on the ***maximum Extractive Industry Threshold limit of 200,000 tonnes*** applied for in the Material Change of Use. Although it is not envisaged that the development will reach 200,000 tonne in the first few years, the 200,000 tonne upper limit will cater for possible future demand as business improves.

Given the 200,000 tonne annual production limit and assuming 312 working days per year (based on 52 working weeks/year x 6 working days/week), the expected heavy vehicle (HV) movements associated with the delivery of sand is 18 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, no increase in staff is required for the expansion to 200,000t. As part of the forecast business operations at the proposed development, it is anticipated that no more than 21 vehicle trips (18 x HV, 2 x Workers SHIFT START/END, 1 x other LV) 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 42 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 Attachment C) by DTMR 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)
- Rockhampton – Yeppoon Road (196)
- Bruce Highway (10E)
- Port Curtis Way (181)

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 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)	2013 Background ESA's	2013 Development ESA's	% of Background
511	Bruce - Show Grd	0.8	43.3%	2.17×10^5	1.84×10^4	8.5%
511	Show Grd - Western St	1.2	43.3%	2.05×10^5	1.84×10^4	9.0%
511	Western St - Lion Ck Rd	0.2	43.3%	2.05×10^5	1.84×10^4	9.0%
511	Lion Ck Rd - Six Mile Rd	1.8	100.0%	2.05×10^5	4.26×10^4	20.8%
511	Six Mile Rd - Nine Mile Rd	0.7	100.0%	1.09×10^5	4.26×10^4	38.9%
10F	Bolsolver St - Knight St	1.5	43.3%	9.65×10^5	1.84×10^4	1.9%
10F	Knight St - Alexandra St	0.7	26.6%	9.65×10^5	1.13×10^4	1.2%
10F	Alexandra St - Shopping Fair	0.8	26.6%	9.65×10^5	1.13×10^4	1.2%
10F	Shopping Fair - Richardson Rd	1.2	26.6%	1.02×10^6	1.13×10^4	1.1%
10F	Richardson Rd - Farm St	0.7	26.6%	8.12×10^5	1.13×10^4	1.4%
196	Cambell St - QEII Drv	1.4	16.6%	1.09×10^6	7.07×10^3	0.6%
196	Farm St - Headlow ck	14.8	10.0%	3.33×10^5	4.26×10^3	1.3%
196	Headlow ck- 3.9k SW ofINT 196/197	11.9	10.0%	4.51×10^5	4.26×10^3	0.9%
194	QEII Drv - Dean St	1.4	16.6%	8.40×10^5	7.07×10^3	0.8%
194	Dean St - Thozet Rd	1.1	16.6%	6.22×10^5	7.07×10^3	1.1%
181	CALLIOPE RVR - INT 46A/181	5.3	40.0%	6.10×10^5	1.70×10^4	2.8%
181	RLY O/BRIDGE - CALLIOPE RVR	13.4	40.0%	1.06×10^6	1.70×10^4	1.6%
181	10E/ 181 -RLY O/BRIDGE	13.5	40.0%	1.3×10^6	1.70×10^4	1.3%
10E	INT 10E/10D/185 - INT 10E/181	46.0	40.0%	8.15×10^5	1.70×10^4	2.1%
10E	INT 10E/181 - INT 10E/188	40.0	40.0%	1.16×10^6	1.70×10^4	1.5%
10E	INT 10E/188 - End 10E	35.1	40.0%	1.52×10^6	1.70×10^4	1.1%
10F	INT 10F/196/10E - Bolsover St	0.8	40.0%	9.69×10^5	1.70×10^4	1.8%

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

Development Starting Year:	2013
Assessment Period:	10 Years
Road Rehabilitation Contribution:	0.85 ¢/tonne
Routine Maintenance Contribution:	4.00 ¢/tonne
Total Contribution:	**4.85 ¢/tonne**

The results from the PIA Spreadsheet (refer Appendix D) indicates that the proposed Extractive Industry Threshold limit of 200,000 tonne/annum transported on the SCR **will trigger** both Routine Maintenance and 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 42 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	2012 AADT	Development Generated Traffic (Veh / day)	% of Background
511	Bruce - Show Grd	5100	42	0.82%
511	Show Grd - Western St	4822	42	0.87%
511	Western St - Lion Ck	3205	42	1.31%
511	Lion Ck Rd - Six Mile	3205	42	1.31%
511	Six Mile Rd - Nine Mile	2000	42	2.10%
10F	Bolsolver St - Knight St	33220	42	0.13%
10F	Knight St - Alexandra	33220	42	0.13%
10F	Alexandra St -	33220	42	0.13%
10F	Shopping Fair -	23549	42	0.18%
10F	Richardson Rd - Farm	15891	42	0.26%
196	Cambell St - QEII Drv	34000	42	0.12%
196	Farm St - Headlow ck	8024	42	0.52%
196	Headlow ck- 3.9k SW ofINT 196/197	10894	42	0.39%
194	QEII Drv - Dean St	16915	42	0.25%
194	Dean St - Thozet Rd	11511	42	0.36%
181	CALLIOPE RVR - INT	4385	42	0.96%
181	RLY O/BRIDGE -	7434	42	0.56%
181	10E/ 181 -RLY	10781	42	0.39%
10E	INT 10E/10D/185 - INT	4880.5	42	0.86%
10E	INT 10E/181 - INT	6565	42	0.64%
10E	INT 10E/188 - End	14041	42	0.30%
10F	INT 10F/196/10E -	25145	42	0.17%

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 2.1% of the background volume.

SCR Traffic Operation Assessment (TOA) – Intersection Assessment

The TOA also investigates turn warrant treatments at all intersections where the development generated traffic equals or exceeds the 5% threshold.

The table below compares the existing turn volumes at the indicated intersections between the hours of 6:00 to 18:00 (requested and supplied by DTMR officer Mr Chris Murphy) with the forecast development generated traffic volumes for each intersection:

	Intersection	Intersection No.	Date of Count	Turn	6:00am - 6:00pm Traffic (year of count)	Traffic (projected 3% to current) converted to AADT (*1.25 conversion)	Development Generated Traffic (Veh/day)	% of Background
COMMON ROUTES TO ALL SITES	Rockhampton Ridgelands & Nine Mile Rd	2003	20/07/2010	Right out	189	256.25	21	8.2
		2003	20/07/2010	Left in	186	253.75	21	8.28
	Campbell (511) & Albert Street (10F)	562	28/04/2010	Thru in	636	872.5	3	0.4
		562	24/04/2010	Thru out	980	1343.75	3	0.3
		562	24/04/2010	Right in	236	323.75	7.2	2.3
		562	28/04/2010	Left out	213	292.5	7.2	2.5
	Campbell & Fitzroy St	457	14/01/2010	Left in	69	96.25	3	3.2
		457	14/01/2010	Right out	865	1196.25	3	0.3
	Queen Elizabeth Dr & Lakes Crk Rd	66	22/06/2010	Right out	5286	7200	3	0.1
		66	22/06/2010	Left in	6838	9313.75	3	0.1
	Thozet Rd & Lakes Crk Rd	383	24/06/2010	Left in	2458	3347.5	3	0.1
		383	24/06/2010	Right out	2670	3636.25	3	0.1
	Albert & Bolsover St	571	27/07/2010	Left in	3250	4413.75	7.8	0.2
		571	27/07/2010	Right out	2037	2766.25	7.8	0.3
	Bruce Hwy & Knight St	572	27/07/2010	Left in	1918	2605	3	0.2
		572	27/07/2010	Right out	1712	2325	3	0.2
	Yaamba Rd & Moores Crk Rd	823	21/11/2009	Left in	3901	5408.75	5	0.1
		823	21/11/2009	Right out	4556	6316.25	5	0.1
	Yaamba Rd & Farm St	579	22/07/2010	Left in	479	652.5	3	0.5
		579	22/07/2010	Right out	810	1103.75	3	0.3
	**Rockhampton Ridgelands & Exhibition Drv			Thru in	1275	1608.75	2	0.2
				Thru out	1275	1608.75	2	0.2
TO SITE 4	Bruce Hwy & Yeppoon Rd	827	2/08/2012	Right in	2154	2757.5	2	0.1
		827	2/08/2012	Left out	2249	2878.75	2	0.1
	***Yeppoon Rd & Millroy Drv			Left in	108.94	136.25	2	1.5
				Right Out	108.94	136.25	2	1.5
TO SITE 5	Albert St & George St	560	19/02/2013	Left in	4964	6261.25	8	0.2
		560	19/02/2013	Right out	5511	6951.25	8	0.2
	Bruce Highway & Gladstone Mt Larcom Rd	51	1/03/2011	Left in	1116	1493.75	8	0.6
		51	1/03/2011	Right out	1136	1520	8	0.6
	Bruce Hwy & Port Curtis Way	1997	6/03/2012	Right in	2433	3151.25	8	0.3
		1997	6/03/2012	Left out	2547	3298.75	8	0.3
	Hanson Rd & Kingdon St	1719	4/05/2011	Left in	244	312.5	8	2.6
		1719	4/05/2011	Right out	373	477.5	8	1.7

* As per Chapter 13, Appendix D - 24 hour/12 hour volume ratios are typically 1.20 to 1.25 for rural roads.

** Traffic data unavailable. Turns calculated as **25%** (% assumed for Thu in & Thru out) of AADT for Rockhampton Ridgelands Rd (Bruce Hwy to show grounds).

*** Traffic data unavailable. Turns calculated as **1%** (% assumed for Left in/ Right out) of AADT for Rockhampton Yeppoon Rd (Headlow ck to 3.9k SW of INT 196/197).

Traffic generation is based on an equal traffic split to each delivery location. As noted previously, there are 18 daily HV trips with 3 LV trips for a total of 21 daily trips (or 42 movements).

Traffic generation splits for the original approval of 100,000t are still based on equal distribution to each of Site 1, 2 and 3. This equates to approx. 3 vehicle trips to each location per day.

Traffic generated to Site 4 will be based on the delivered 20,000t annually and equate to approx. 2 vehicle trips per day.

Traffic generated to Site 5 will be based on the delivered 80,000t annually and equate to approximately 8 vehicle trips per day.

From the DTMR traffic data (refer Appendix C) the preceeding table shows that SCR Intersection No. 2003, Rockhampton Ridgelands and Nine Mile Road has a development impact greater than that considered background growth (8.2%).

A review of the turn warrant treatment at this intersection (refer to Attachment F for proposed Layout) proves that for both pre and post development the existing BAL does not cater for the turn volumes experienced. As this is an existing condition that the development generations only slightly exacerbate our client is agreeable to providing a contribution to assist in the upgrade of the intersection to an AUL standard (refer to Attachment E). It is also considered that a SIDRA analysis is not warranted at this stage reasoned upon the following:

- It is unlikely a SIDRA analysis will reveal any traffic deficiencies that DTMR are not already aware of;
- Our client's contribution will assist DTMR in any future analysis, design and upgrading to the appropriate standard of this intersection.

All other turn movements on impacted intersections will produce development generated traffic less than 2.6% of the background volume. Therefore, in accordance with the GARID and from both a network and an intersection perspective, development volumes are not considered significant (defined as expected growth) and as a result further detailed intersection investigation (including SIDRA) is not warranted. Notwithstanding the above, it is 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 (Appendix I). 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, Fogarty Road has been upgraded to a standard suitable for heavy vehicle traffic.

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

To achieve the operational access requirements, the following minimum road design elements have been considered:

- Less than 42 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.

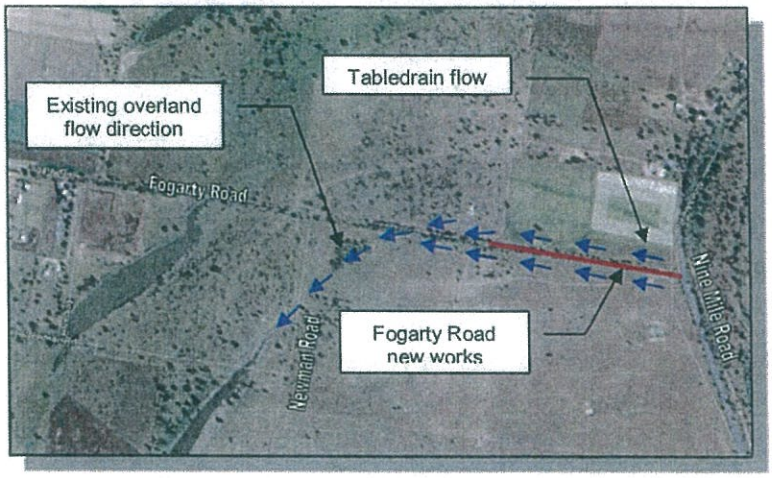
Due to the isolated traffic catchment (road predominately used by this development only), extremely poor subgrade conditions (typically black soil) and the high content of heavy vehicle movements, bituminous surfacing has been omitted in lieu of regular maintenance grading and gravel re-sheeting by the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

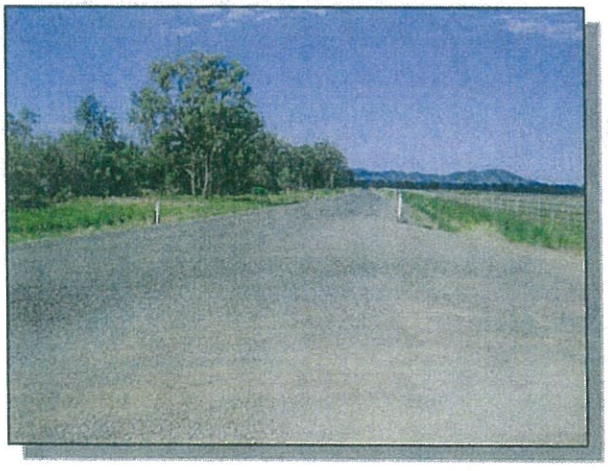


Figure 10: ►
Fogarty Road and Nine Mile Road intersection looking west

◄ 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 vertical geometry is flat with a number of floodway and creek crossings, while the horizontal geometry is moderately winding with large sweeping bends.

Figure 12: ▶
Nine Mile Road looking north

◀ Figure 11:
Nine Mile Road looking south

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

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

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

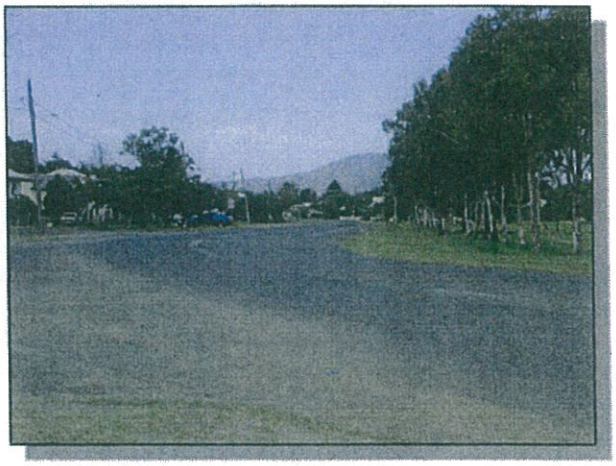


Figure 16: ►
Lion Creek Road looking north-east from intersection

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

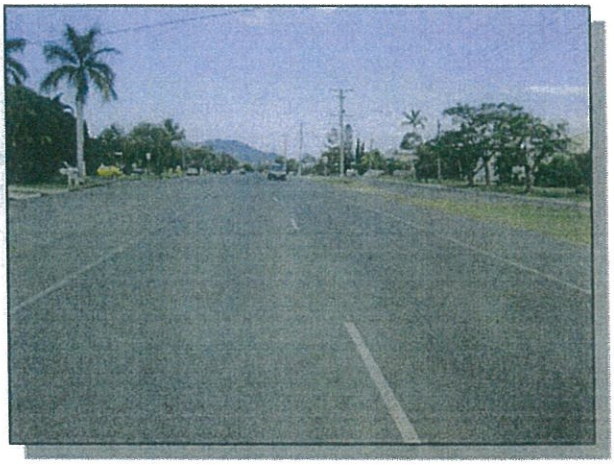


Figure 18: ►
Lion Creek Road looking east showing flat terrain

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 serviced 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.

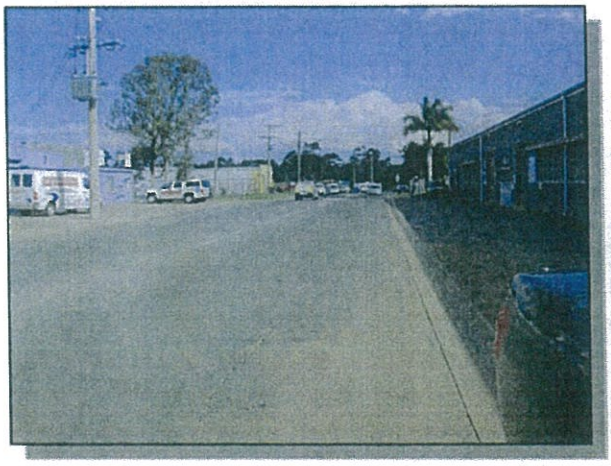
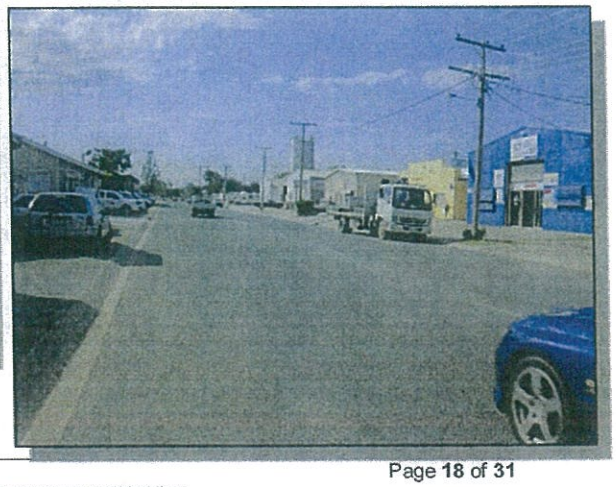
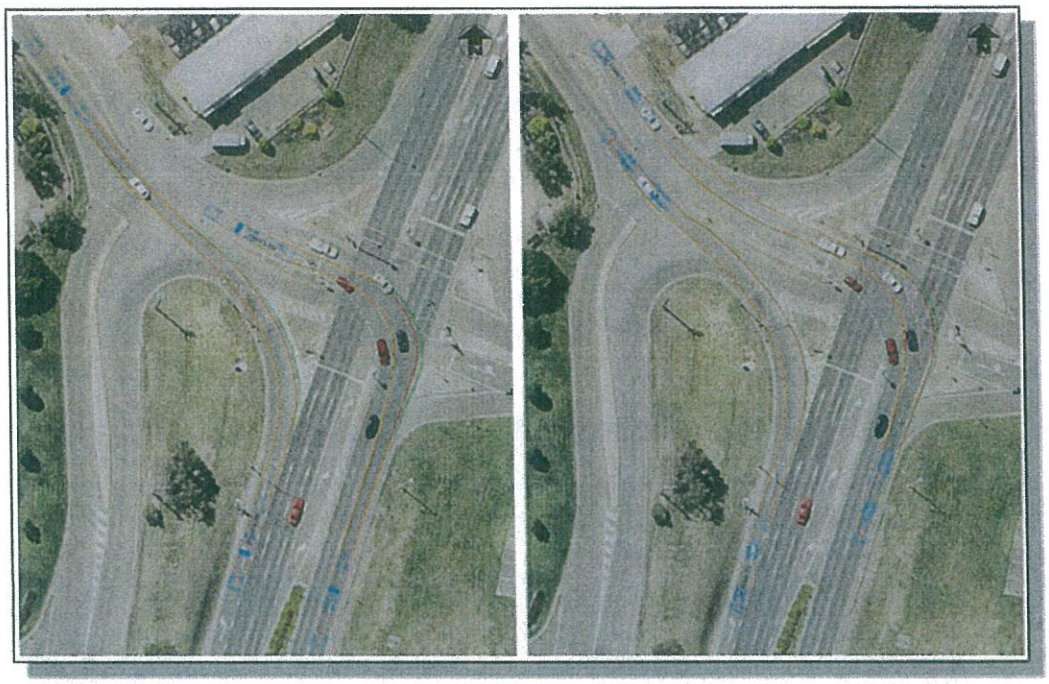


Figure 21: ►
Knight Street looking north-west showing existing commercial and industrial development

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





▲ 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

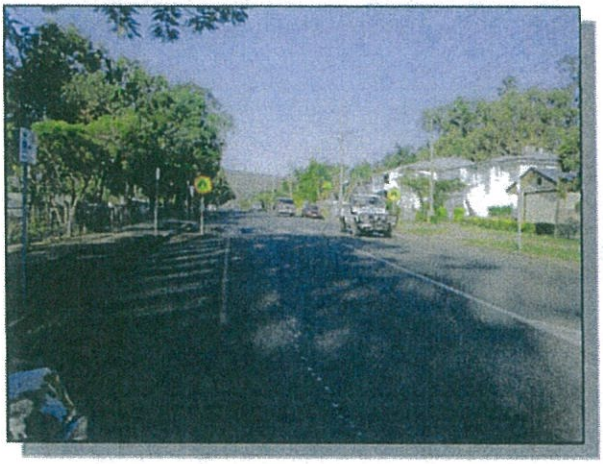
The Bruce Highway and Musgrave Street Intersection is a major junction between the Fitzroy River Bridge and Neville Hewitt Bridge road corridors. The intersection is signal controlled and has a dual lane 'high entry angle' left-turn (CHL) for north-bound movements. Vehicles turning right from the Bruce 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 proposed 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

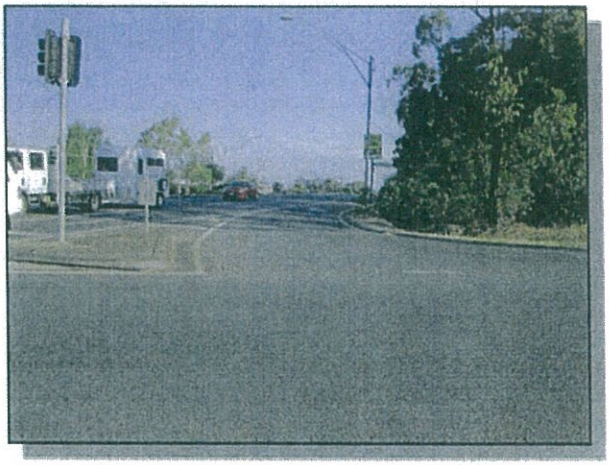


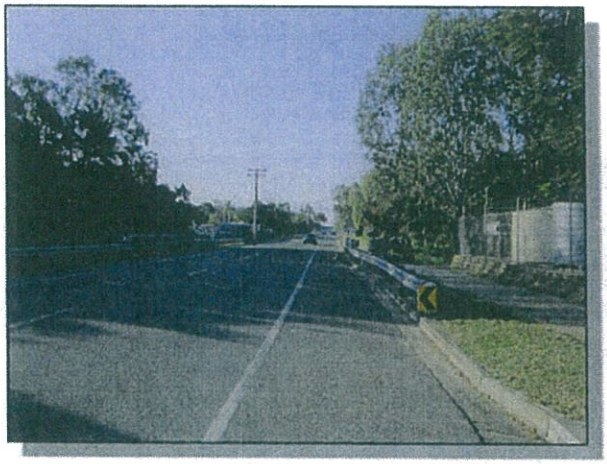
Figure 25: ►
Bruce Highway and Farm Street intersection looking south showing free CHL into Farm Street

▲ 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

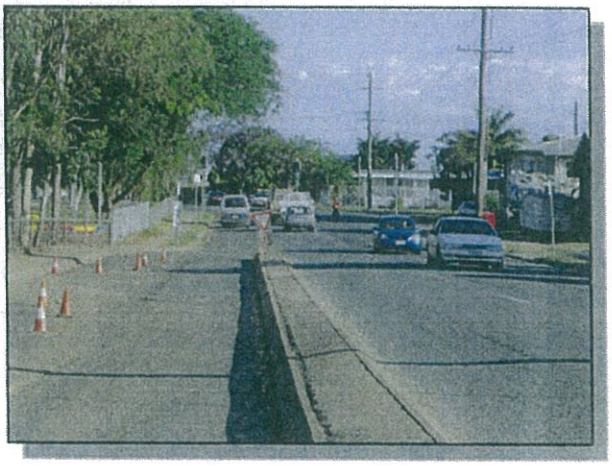


Figure 28: ►
Farm Street and McLaughlin Street intersection looking south at service road

▲ 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

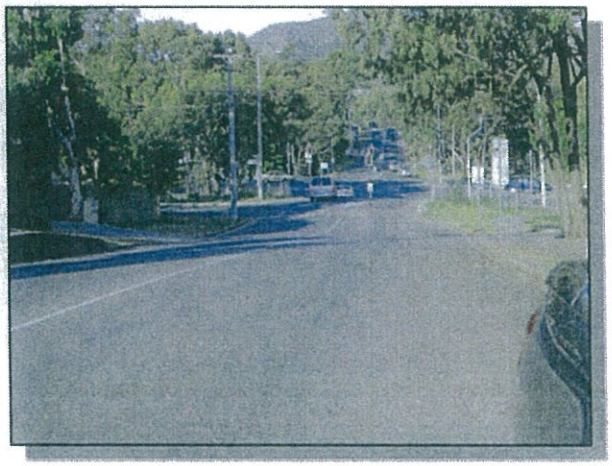
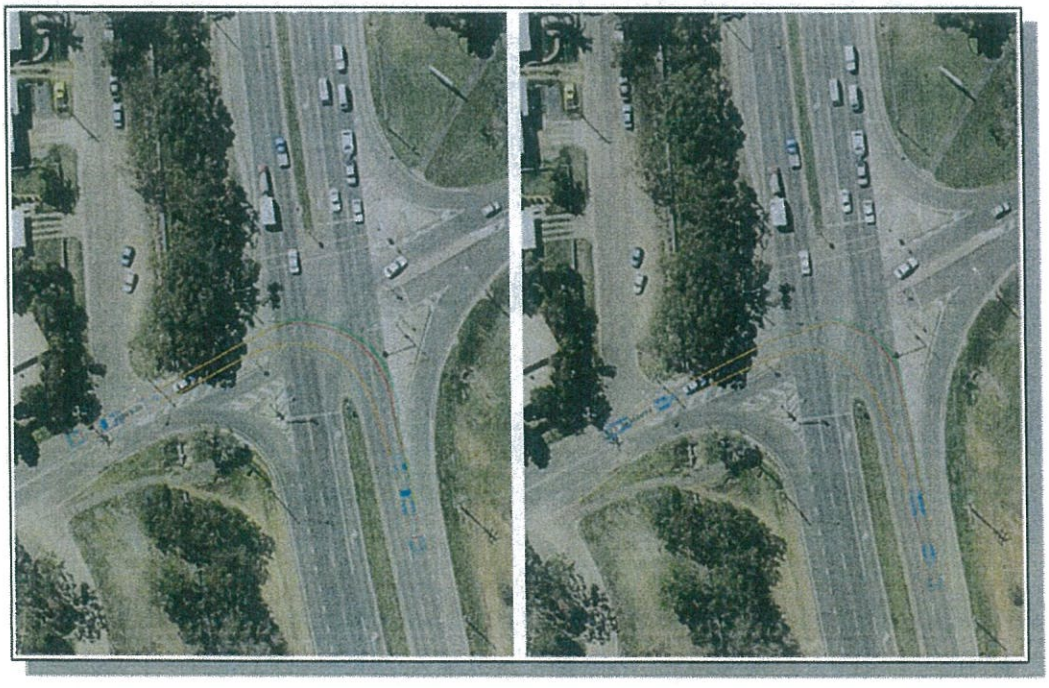


Figure 31: ►
McLaughlin Street and Bruce
Highway intersection looking east

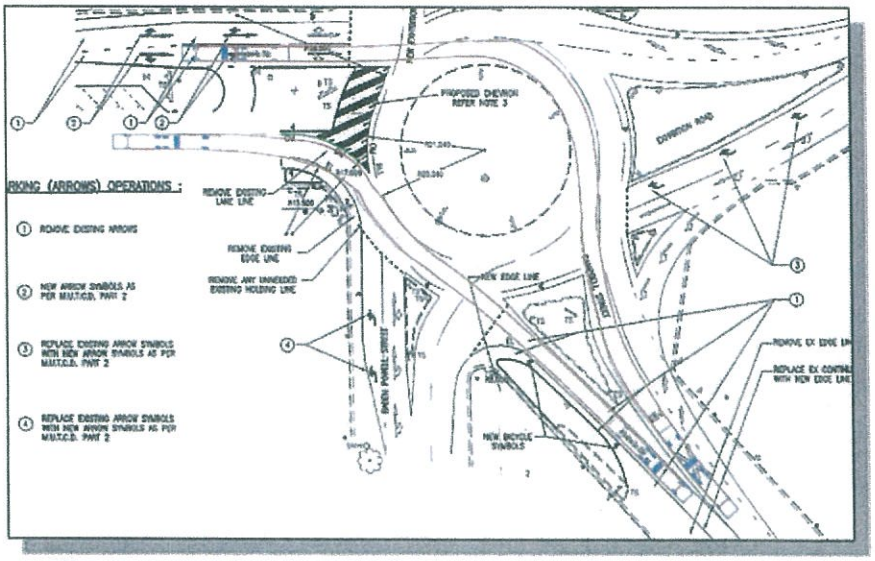


▲ Figure 32:
Carlton Street and Bruce Highway intersection HV swept paths
Left: Truck and Dog Trailer, Right: Semi Trailer

Rockhampton- Ridgelands Road and Campbell Street

The intersection consists of a 5-way roundabout configuration with single/dual circulating lane/s. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this intersection.

Rockhampton-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

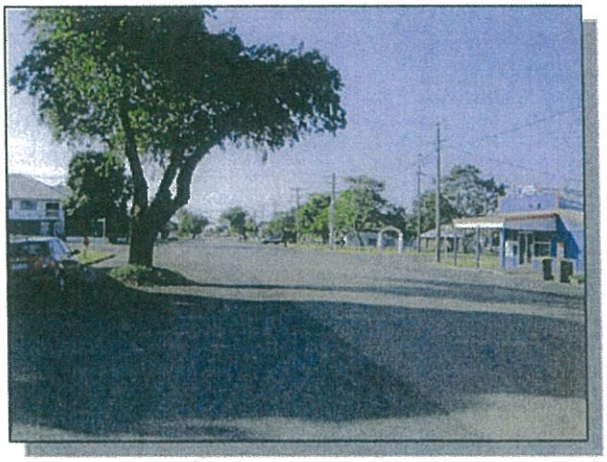
The Campbell Street and Archer Street intersection has a roundabout configuration with single circulating lane. Both Truck & Dog trailer and Semi trailer HV movements are catered for at this roundabout.

◄ 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 islands. Vehicles turning right from Fitzroy Street are serviced by a signalized CHR.

Campbell Street 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

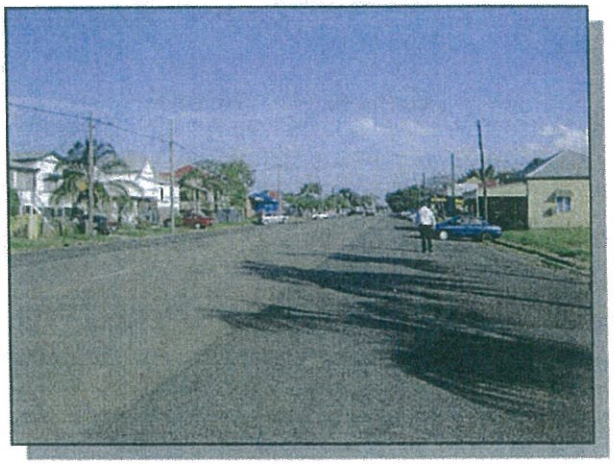


Figure 36: ►
Campbell Street looking west
showing flat terrain

▲ 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 serviced by dual signalized 'high entry angle' CHL.

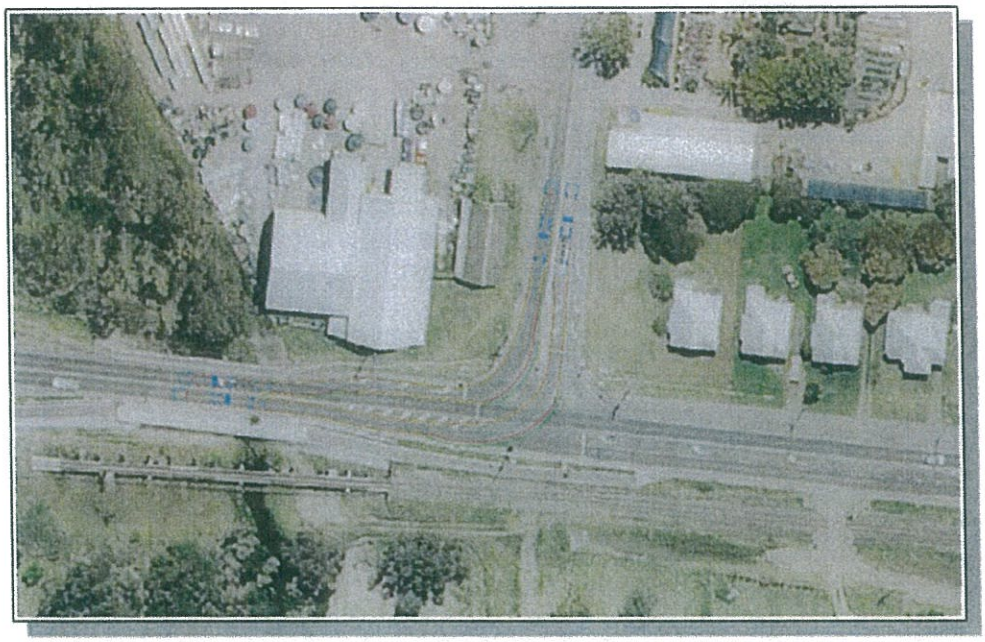
Fitzroy Street / Queen Elizabeth Drive traffic lanes vary between 4 x 3.0m undivided lanes (on the Fitzroy River Bridge) and 4 x 3.5m divided lanes (through the Central Business District - CBD). The road traverses the heart of the CBD which is a mix of retail, commercial and entertainment zones. It is 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.

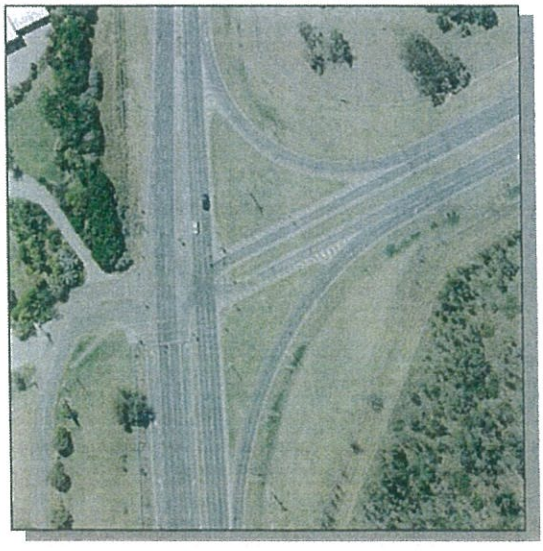
Lakes Creek Road traffic lanes are 2 x 3.5m wide with sealed shoulders between 2.0m and 2.5m. The road traverses a mix of residential and commercial zones with some areas accessed by service roads. It is also noted that a high proportion of HV (including quarry and cattle transport companies) cart materials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



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

Bruce Highway and Yeppoon Rockhampton Road

The Bruce Highway and Yeppoon Road intersection is a 4-way signalized configuration with raised concrete central medians. Right-turn movements from the Bruce Highway onto Yeppoon Road are catered for by a CHR and left turn movements onto the Bruce Highway are facilitated by a 'high entry angle' CHL.



◄ Figure 40:
Bruce Highway and Yeppoon Rockhampton Road Intersection

Yeppoon Rockhampton Road and Milroy Drive

The Yeppoon Rockhampton Road and Milroy Drive intersection is a 4-way configuration with painted central medians. Left-turn movements from Yeppoon Road into Milroy Drive are catered for by a CHL. A Basic-Right turn (BAR) is provided for right-turn movements out of Milroy Drive.

▲ Figure 41:
Yeppoon Rockhampton Road and Milroy Drive

Albert Street and George Street

The Albert Street and George Street intersection has a 4-way signalized configuration with raised concrete central medians. Vehicles turning left from Albert Street into George Street are serviced by a signalized dual lane AUL. Right-turn movements from George Street into Albert Street are facilitated by a signalized dual lane CHR.

▲ Figure 42:
Albert Street and George Street intersection.

Bruce Highway and Gladstone Mt Larcom Road

The Bruce Highway and Gladstone Mt Larcom Road intersection is a Tee configuration with central medians. Left-turn movements from the Bruce Highway into Gladstone Mt Larcom Road are catered for by a 'high entry angle' CHL. A Basic-Right turn (BAR) is provided for vehicles turning right onto the Bruce Highway.

◄ Figure 43:
Bruce Highway and Gladstone Mt Larcom Road intersection

Gladstone Mt Larcom Road and Port Curtis Way

The intersection of Gladstone Mt Larcom Road and Port Curtis Way is a 3 way Tee configuration with central medians. Right-turn movements from Gladstone Mt Larcom Road into Port Curtis Way are catered for by a wide angle Basic-Right turn (BAR). Vehicles turning Left from Port Curtis Way onto Gladstone Mt Larcom Road are serviced by a wide angle AUL.

▲ Figure 44:
Gladstone Mt Larcom Road and Port Curtis Way Intersection.

Hanson Road and Kingdon Street

The Hanson Road and Kingdon Street intersection is a Tee configuration. A Basic-Left turn (BAL) is provided for traffic turning into Kingdon Street from dual laned Hanson Road. Right-turn movements from Kingdon Street are catered for by a Basic-Right turn (BAR).

▲ Figure 45:
Hanson Road and Kingdon Street intersection.

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 are provided below:

- Truck & Dog trailer and/or Semi trailer vehicles will be used to cart the material to the (proposed) 5 major supplier sites.
- 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 42 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 4.85 ¢/tonne for SCR.
- Rockhampton Ridgelands and Nine Mile Road (SCR Intersection No. 2003) has a development impact greater than that considered standard growth (8.2%). A detailed intersection analysis is therefore required.
- The anticipated traffic operations volumes for all other intersections are less than 5% of the background traffic volume which is considered as expected standard 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 3,4 and 5 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.

I hope this assessment meets with your approval and should you have any questions please do not hesitate to call Ian McMurtrie on (07) 49 211 780.

Yours Sincerely,

Certified by Ian McMurtrie (RPEQ: 1347)
(Director)

Reference Material

- Austroads – Guide to Road Design
- 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

Appendices

- Appendix A – Preliminary Traffic Evaluation
- Appendix B – Original Approval D/394-2011
- Appendix C – DTMR Pavement, Road and Traffic Data
- Appendix D – PIA (Spreadsheet Results)
- Appendix E – Turn Warrant Assessment
- Appendix F – Proposed Intersection Upgrade Layout
- Appendix G – Tapsell Consulting Engineers - Proposed Site Development Layout
- Appendix H – Schlencker Surveying – Detail and Level Survey Plan
- Appendix I – Vehicle Swept Path Plans