Styx Coal

Fairway Coal

Styx Coal & Fairway Coal

Styx Coal Project

Initial Advice Statement

December 2016

CDM Smith

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Acronyms and Abbreviations

Acronyms and abbreviations used in this document are tabulated below.

Acronym	Description
AHD	Australian Height Datum
ANC	Acid neutralising capacity
AUSIMM	Australian Institute of Mining and Metallurgy
BoM	Bureau of Meteorology
CCL	Capricornia Coastal Lands
CHPP	Coal handling and preparation plant
CLR	Contaminated Land Register
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DERM	Department of Environment and Resource Management (former)
DNRM	Department of Natural Resources and Mines
DotEE	Department of the Environment and Energy (Commonwealth)
EA	Environmental Authority
EC	Electrical conductivity
EHP	Department of Environment and Heritage Protection
EIS	Environmental Impact Statement
EMR	Environmental Management Register
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPC	Exploration Permit for Coal
EPM	Exploration Permit for Minerals
ERA	Environmentally Relevant Activities
EVNT	Endangered, vulnerable and near threatened
GBR	Great Barrier Reef
GMU	Groundwater Management Unit
GQAL	Good Quality Agricultural Land
HGTC	High grade thermal coal
HME	Heavy Mobile Equipment
HV	Heavy vehicle
ICMM	International Council on Mining and Metals
IAS	Initial Advice Statement
JORC	Joint Ore Reserves Committee
Kv	kilovolt
MCC	Motor control centres
MDL	Mineral Development Licence
MIA	Mine Industrial Area
ML	Mining lease
MLA	Mining lease application
MR Act	*Mineral Resources Act 1989*
Mt	Million tonnes
Mtpa	Million tonnes per annum
NAF	Non-Acid Forming
NC Act	*Nature Conservation Act 1992*
OECD	Organisation for Economic Co-operation and Development
OF	Optical fibre
PAF	Potentially Acid Forming
PLC	Programmable logic controls
RE	Regional Ecosystem
RMP	Road Use Management Plan
ROM	Run of mine
SCADA	Supervisory Control and Data Acquisition
SCL	Strategic Cropping Land
SDS	Safety data sheets
SHMS	Safety and Health Management System

Acronym	Description
SSCC	Semi-soft coking coal
STP	Sewage treatment plant
TEC	Threatened ecological communities
TLF	Train loadout facility
TMP	Traffic Management Plan
ToR	Terms of Reference
VM Act	*Vegetation Management Act 1999*

1 Introduction

1.1 Background

Styx Coal Proprietary Limited (Styx Coal) and Fairway Coal Proprietary Limited (Fairway Coal) (the joint Proponent), both wholly owned subsidiaries of Mineralogy Proprietary Limited propose to develop the Styx Coal Project (the Project) located 130 km northwest of Rockhampton in the Styx Basin in Central Queensland (see Figure 1-1). The Project will be located within Mining Lease Application (MLA) 80178, which is adjacent to Mineral Development Licence (MDL) 468 and Exploration Permit for Coal (EPC) 1029.

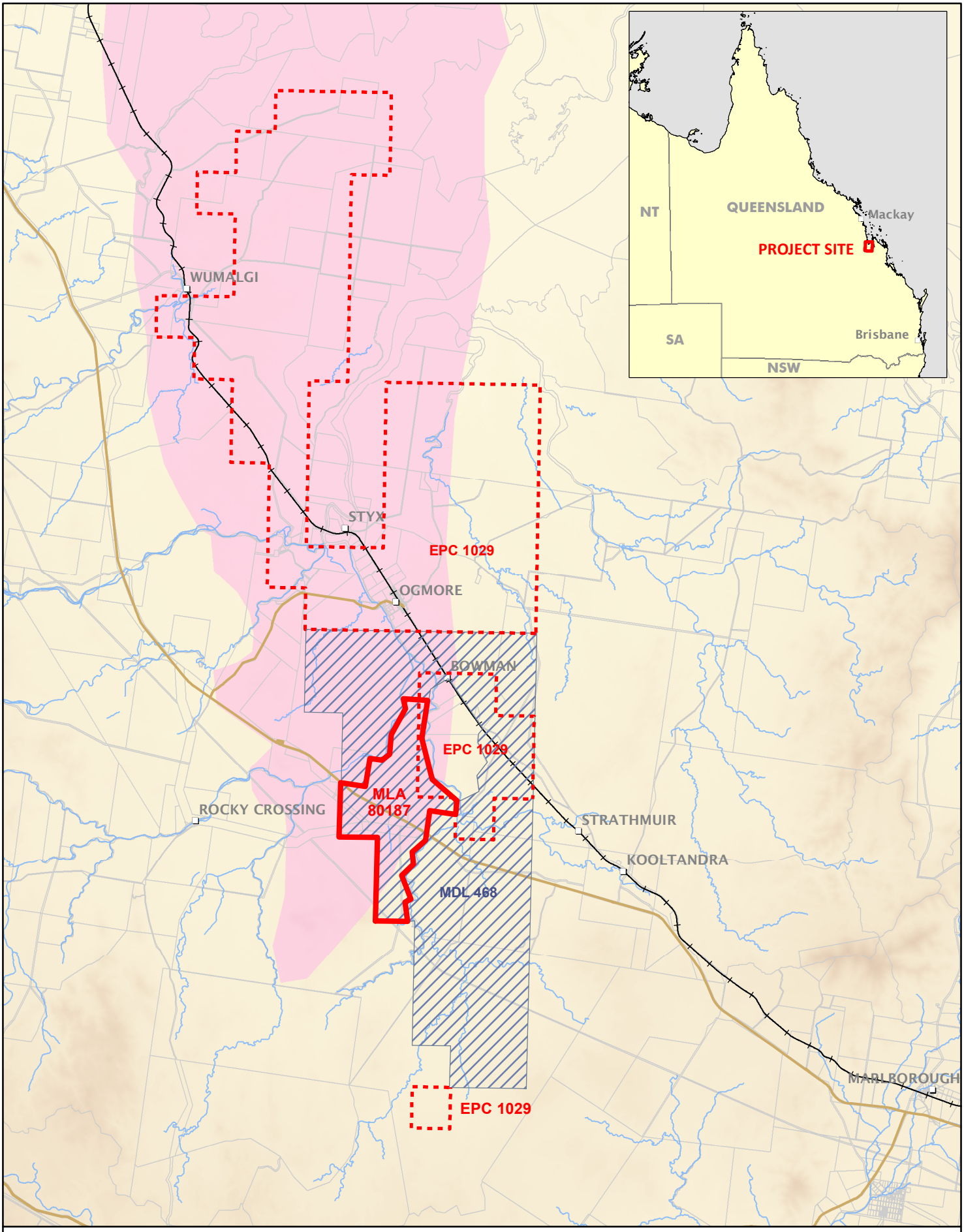
The Project will initially involve the mining of an approximately 2 million tonnes per annum (Mtpa) with options of increasing to 5 or 10 Mtpa of high grade thermal coal (HGTC) and/or semi-soft coking coal (SSCC). Development of the Project is expected to commence in 2018 and extend for approximately 20 – 25 years until the current reserve is depleted.

The Project consists of two open cut pit operations that will be mined using a truck and shovel methodology. The run-of-mine (ROM) coal will commence at 2 Mtpa with options to ramp up to approximately 5 Mtpa during Stage 1 (Year 1-2), where coal will be crushed and screened to HGTC with an estimated 95% yield. Stage 2 of the Project (Year 2-20) will include further processing of the coal within a coal handling and preparation plant (CHPP) which will be located in the Mine Industrial Area (MIA) to produce SSCC, with an estimated 80% yield. During Stage 2 of operation, production could potentially increase to a combined 10 Mtpa of HGTC and SSCC.

A new train loadout facility (TLF) will be developed to connect into the existing North Coast Rail Line. The TLF will require all new infrastructure and connect to the existing north coast rail network which will allow transport of the product coal to the established coal loading infrastructure at the Dalrymple Bay Coal Terminal (DBCT). There also exists the option to utilise southern coal terminals in Gladstone.

The Project is generally within the Livingstone Shire Regional Council area and is located on gently undulating plains and slopes. TLF Option 5 is located nearby to Wumalgi within the Isaac Regional Council area. The nearest major regional centre is Rockhampton, located approximately 130 km to the south of the Project (see Figure 1-1). Apart from the TLF, the Project is located on the Mamelon property, described as real property Lot 11 on MC23, Lot 10 on MC493 and Lot 9 on MC496. Mamelon is currently owned by QNI Metals Pty Ltd and leased to a third party.

The typical elevation of the proposed MLA ranges from 4.5 to 155 metres above Australian Height Datum (AHD). The Project area has several ephemeral creeks that drain the site to the east towards St Vincent Gulf.



Legend

- Fairway Coal Pty Ltd Exploration Permit for Coal
- Styx Coal Project Mining Lease Application Area
- Fairway Coal Pty Ltd Mineral Development Licence
- Styx Basin
- Cadastral boundary
- North Coast Rail Line
- Main road
- Watercourse

0 2.5 5 km

Scale @ A4 1:220,000
Date: 02/12/16
Drawn: Gayle B.

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

Figure 1-1
Regional Project location

CDM Smith

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1.2 The Proponent

The Project will be developed and operated by Fairway Coal and Styx Coal. Both companies are private companies and are subsidiaries of Mineralogy Pty Ltd (Mineralogy).

Fairway Coal is a privately owned Australian coal exploration and coal development company that holds extensive mining concessions within the rich mineral basins of Laura, Bowen, Surat, Moreton, Nymboida and the Northern Territory, in addition to the Styx Basin.

The contact details for the Project are:

Nui Harris

Managing Director

Fairway Coal Pty Ltd

GPO Box 1538

Brisbane Qld 4001

1.3 Project Justification

The Project will produce both thermal (HGTC) and coking (SSCC) coal for export. Thermal and coking coals are in demand globally to generate electricity and steel, respectively. Recent demand for both thermal and coking coal has increased significantly with spot prices reaching US$100 and US$300 free on board (FOB), respectively. Quarterly contract sale prices have also significantly increased with the next quarter contracts for thermal and coking coal reaching US$100 and US$200/tonne FOB respectively. As an indication of the extent to which global demand has changed, coking coal spot price (daily market price), was $US73.40/tonne in November 2015 and in November 2016 prices reached $US289.30/tonne; a four year high (~400% increase) (Office of the Chief Economist, 2016; Kerr, 2016). The demand for thermal and coking coal, and subsequent coal spot prices makes this project economically viable.

With respect to thermal coal, the United States (US) International Energy Agency (IEA) predicts global energy consumption to grow by 37 per cent (%) by 2040 (US IEA, 2014). This is taking in to account existing and planned government policies regarding climate change. In 2040, natural gas, oil and coal will each account for roughly one-quarter of the world's energy needs (US IEA, 2014).

Among these fossil fuels, coal demand is predicted to grow most rapidly, driven largely by growth in non-Organisation for Economic Co-operation and Development (OECD) countries. Asia accounts for 60% of the growth of energy demand and it is predicted that by 2025, China will make up 24% of the global energy demand. From 2025 to 2040, India is likely to take over China as the main source of global demand growth (US IEA, 2014). Increases in demand are predicted to continue for approximately the next ten years (US IEA, 2014).

Australia exported 201 million tonnes (Mt) of thermal coal during the 2014 – 2015 financial year, valued at over $15 billion, and is expected to increase to 202 Mt with a revenue of $14 billion this financial year (Office of the Chief Economist, 2015). Australia's thermal coal exports are expected to increase by 11% per annum between 2013 and 2017, from approximately 162 Mtpa to approximately 271 Mtpa (Australian Coal Association, 2012). South east Asian thermal coal demand is expected to triple in the next 25 years (IEA, 2015a). The Styx Coal Project will help supply the demand growth.

As with thermal coal, non-OECD countries are also predicted to drive global growth in coking coal consumption and production over the medium term as steel is required to support growing infrastructure needs (Office of the Chief Economist, 2015). Australia exported 183 Mt of coking coal during 2014 – 2015 financial year, valued at over $21 billion, and this is expected to increase to 191 Mt this financial year (2015-2016) at a relative value of $20 billion (Office of the Chief Economist, 2015). Importantly, about $1.61 billion (80%) of the royalties paid to the Queensland Government in 2014–15 were attributed to coal sales. With increased pricing in both thermal and coking coal it is expected that the royalty contribution will increase.

Australian production rates of coking coal are expected to increase at a rate of 2.1% per year until 2020. This growth will be supported by new projects such as the Project. The current increases in global demand for coal and forecast increases in production support the justification for the Project.

1.4 Purpose and Scope of the Initial Advice Statement

The Proponent is seeking to have the Project assessed via an Environmental Impact Statement (EIS) prepared under Chapter 3 of the *Environmental Protection Act 1994* (EP Act). In accordance with Section 71 of the EP Act, this Initial Advice Statement (IAS) has been prepared to support the application for a voluntary EIS.

The purpose of this IAS is to provide sufficient information to:

- Assist the Queensland Government Department of Environment and Heritage Protection (EHP) in assessing the application to prepare a voluntary EIS;
- Assist the Department of the Environment and Energy (DotEE) with the assessment of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral;
- Inform preparation of a Terms of Reference (ToR) for the voluntary EIS; and
- Inform stakeholder and the general public about the nature, scope and location of the Project, and key environmental issues that will be investigated through the EIS process.

2 Project Approvals

2.1 Commonwealth Approvals

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage Matters of National Environmental Significance (MNES) including nationally and internationally important flora, fauna, ecological communities, heritage places and water resources. The EPBC Act implements obligations under international conventions and treaties, such as protection of migratory species (Migratory Bird Agreements and Bonn Convention, 1979) and World Heritage Area values (World Heritage Convention, 1972).

The EPBC Act is administered by DotEE and establishes a process for assessment and approval of proposed actions that have, or are likely to have, a significant impact on MNES. Proponents refer projects to DotEE initially for determination on whether a project is a controlled action or not a controlled action. If the referral is deemed to be a controlled action, then it is likely to have a significant impact on MNES and must be undertaken in accordance with prior approval from the Minister

The Proponent will lodge a Referral Application to DotEE under the EPBC Act. It is anticipated that the Project will be declared a controlled action requiring assessment by an EIS process accredited under the bilateral agreement between the Commonwealth and Queensland Governments.

Controlling provision are anticipated to be:

- Listed and threatened species and communities (Section 18 and 18 A);
- Listed migratory species (Section 20 and 20A); and
- Water resources (Section 24D and 24E).

The EPBC Act also establishes the Australian Heritage List, which includes natural, Indigenous and historic places that are of outstanding heritage value to the nation. The Act also establishes the Commonwealth Heritage List, which comprises natural, Indigenous and historic places on Commonwealth lands and waters or under Australian Government control, and identified by the Minister for the Environment (the Minister) as having Commonwealth Heritage values. There are no listed areas within or adjacent to the MLA area.

The EPBC Act Environmental Offset Policy provides upfront guidance on the role of offsets in environmental impact assessments, and how the department considers the suitability of a proposed offset. Offsets are defined as measures that compensate for the residual impacts of an action on the environment, after avoidance and mitigation measures are taken. This policy aims to improve environmental outcomes through the consistent application of best practice offset principles and encourage advanced planning of offsets. Offsets will be considered during the assessment phase of the environmental impact assessment and the suitability of a proposed offset is considered as part of the decision to approve or not approve a proposed action under the EPBC Act.

2.1.2 Native Title Act 1993

The *Native Title Act 1993* (Cth) (NT Act) recognises the land rights and interests of Indigenous peoples where they have historically resided and regulates the conduct of 'future acts', including development. The legislation provides for the determination of Native Title claims, the treatment of 'future acts' that may impact on Native Title rights and the requirement for consultation and/or notification to relevant claimants where 'future acts' are involved. The provisions of the NT Act are administered by the National Native Title Tribunal.

The National Native Title Tribunal is established under the NT Act to work with people to understand Native Title and reach outcomes that recognise everyone's rights and interests in land and waters.

The Darumbal People have a current Native Title claim over the area where several of the TLF options are proposed (Tribunal Number: QC2012/008) and the Barada Kabalbara Yetimarala People have a current Native Title claim over the area where the mine pits, ancillary infrastructure are proposed (Tribunal Number: QC2013/004). The MLA area on freehold land on which Native Title has been extinguished. Depending on which TLF option is selected, the existence of Native Title over the haul road and TLF will vary.

2.1.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The purpose of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) (ATSIHP Act) is to preserve and protect from injury or desecration, areas and objects in Australia and in Australian waters that are of particular significance to Aboriginals in accordance with Aboriginal tradition. The ATSIHP Act enables Traditional Owners to make an application to DotEE to declare certain areas or objects as protected. The ATSIHP Act also includes provisions to manage the discovery and appropriate management of Aboriginal remains.

2.1.4 National Greenhouse Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act) provides a single national reporting framework for the reporting and dissemination of information related to Greenhouse Gas (GHG) emissions, GHG projects, energy consumption and energy production of corporations. The NGER Act imposes various registration, reporting and record-keeping requirements.

The NGER Act provides the framework for mandatory reporting of GHG emissions and production and consumption of energy when threshold values are exceeded by a corporation or single facility. Threshold values relevant to the Project are provided in Table 2-1. If these threshold values are exceeded the Proponent as the controlling corporation (as defined under the NGER Act) will apply to the Greenhouse and Energy Data Officer to register on the National Greenhouse and Energy Register. If these values are exceeded, the Proponent must provide annual reports to the data officer on its GHG emissions, energy production and consumption.

Table 2-1 Threshold values of greenhouse gas emissions and production

	Threshold values		
	Emission of GHG	**Energy production**	**Energy consumption**
Controlling corporations	50 kilotonnes per year of carbon dioxide equivalence (CO_2-e)	200 terajoules per year	200 terajoules per year
Single facility	25 kilotonnes per year of CO_2-e	100 terajoules per year	100 terajoules per year

The Technical Guidelines (For the Estimation of Greenhouse Gas Emissions by Facilities in Australia) (Department of Climate Change and Energy Efficiency (DCCEE), 2011) will be used to estimate emission quantities relevant to coal mining activities and to determine if the NGER Act would apply to the Project.

2.2 State Approvals

Queensland legislation of relevance to the Project includes:

- *Mineral Resources Act 1989*;
- *Mineral and Energy Resources (Common Provisions) Act 2014*
- *Environmental Protection Act 1994;*
- *Regional Interests Planning Act 2014;*
- *Environmental Offsets Act 2014;*
- *Water Act 2000;*
- *Coal Mining Safety and Health Act 1999;*
- *Work Health and Safety Act 2011*; and
- *Mineral and Energy Resources (Common Provisions) Act 2014*.

2.2.1 Mineral Resources Act 1989

The *Mineral Resources Act* (MR Act) provides for the assessment, development and utilisation of mineral resources. The MR Act establishes a framework to facilitate mining-related activities, through the leasing of prospecting, exploration, mineral development and mining tenure. The MR act is administered through DNRM.

Granting of a Mining Lease (ML), in conjunction with the issuing of an Environmental Authority (EA) from EHP under the EP Act, entitles the holder to mine specified minerals and carry out activities that are associated with or support the mining activity. The Proponent is seeking the approval for MLA 80187.

Once approved a ML provides entitlements to:

- Enter and be on the ML for mining purposes or transportation through land to access the mining area;
- Use any sand, gravel and rock within lease area for mining activities;

- Prospecting, exploring or mining;
- Processing a mineral won or extracted by the mining;
- An activity that is directly associated with, or facilitates or supports, the mining or processing of the mineral; and
- Rehabilitating or remediating environmental harm because of a mining activity.

The MR Act also sets royalty payments, rents, landholder compensation and notification requirements which the Proponent must comply.

Section 4A of the MR Act precludes the application of the *Sustainable Planning Act 2009* (SP Act) to activities undertaken for purposes of the mining tenure, with the exception of provisions in relation to the *Queensland Heritage Act 1992*. It also makes building work controlled under the *Building Act 1975* self-assessable development within the lease.

Pursuant to the *Mineral Resources Regulation 2003*, various restricted areas have been declared across parts of Queensland that limit exploration and mining activities. Restricted areas may occur within the proposed ML boundaries such as bores and dams and if so, consents to surface rights over these restricted land areas will be required as a prerequisite to grant of the MLs.

2.2.2 Mineral and Energy Resources (Common Provisions) Act 2014

This Act governs land access, limits circumstances to objections on environmental approvals, sets out measures for amends the overlapping tenements regime for coal and CSG, and the mining lease application process for Queensland mining projects. On-tenure land access remains similar; however, there are additional land access framework in place for access to off tenure lands. The processes under this Act will be relevant to the Project once the mining lease application is lodged.

2.2.3 Environmental Protection Act 1994

The EP Act provides the key legislative framework for environmental management and protection in Queensland. The objective of the EP Act is to: 'Protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological processes on which life depends' (s 3). Under the EP Act, the Proponent must comply with the general environmental duty not to undertake an: 'Activity that causes, or is likely to cause, environmental harm unless…all reasonable and practicable measures to prevent or minimise the harm are taken' (s 319).

The process for obtaining an EA for mining activities is established in Chapter 5 of the EP Act. According to the Act, the Project requires a site–specific application for ineligible Environmentally Relevant Activities (ERAs) (s 124), that is for which eligibility criteria are not in effect. The EA imposes environmental management conditions based on EHP's Model Mining Conditions on mining activities undertaken on the ML that the Proponent must comply with. The EIS will establish if the model mining conditions are acceptable or identify areas where suitable alternatives to model conditions are appropriate for the Project and existing background EVs. EHP is the regulatory authority that has responsibility for administration of EAs, oversight of compliance and retaining financial assurance bonds to ensure the area is suitably rehabilitated.

Under changes from *Environmental Protection (Greentape Reduction) and Other Legislation Amendment Act 2012* which commenced on the 31 March 2013, the EIS for the Project will satisfy the Information and Notification stages for EAs and the EA conditions are expected to largely

comprise the model mining conditions. Upon lodgement of the EA application the application will only require the decision stage to be completed, thus reducing the duplication of information submission and public notification which previously existed.

The Proponent has lodged an application for a Voluntary Environmental Impact Statement under the EP Act. The Project is expected to be assessed under Chapter 3, Part 1 of the EP Act. The Proponent proposes to prepare a single EIS that satisfies the requirements of the Commonwealth and State Terms of Reference through the accredited bilateral assessment process.

The Proponent will apply for a site specific EA to undertake ERAs. Pursuant to the EP Act, ERAs are activities that will, or have potential to, release contaminants into the environment and which may cause environmental harm. The EA is an integrated authority that allows for the carrying out of multiple ERAs that are part of a project. The anticipated ERAs applicable to the construction and operational stages are listed in Table 2-2.

Table 2-2 Anticipated ERAs for the Project

ERA Reference	Relevant Activity
ERA 8 (1)(a)	Chemical Storage – more than 500 m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3; or (EP Regulation – Schedule 2, Part 2).
ERA 13	Mining Black Coal
ERA 31 (2b)	Mineral Processing – processing in a year >1,000,000 tonnes or more of mineral products (EP Regulation – Schedule 2, Part 7).
ERA 63 1(a)	Sewage Treatment – operation of a sewage treatment works with a total daily peak capacity of 21 equivalent persons.

2.2.3.1 Notifiable Activities

Land contamination and activities that have been identified as likely to cause land contamination are listed as notifiable activities in Schedule 3 of the EP Act. Any person undertaking these notifiable activities must notify EHP and the land is recorded on the Environmental Management Register (EMR). Potentially notifiable activities associated with the Project are listed in Table 2-3.

Table 2-3 Anticipated notifiable activities for the Project

Item number (Schedule 3 EP Act)	Description of activity
1	Abrasive blasting—carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.
23	Metal treatment or coating - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5L of paint per week.
24	Mine wastes – (a) Storing hazardous mine or exploration wastes, including, for example, overburden or waste rock dumps containing hazardous contaminants; and (b) Mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.
29	Petroleum product or oil storage in above ground tanks.
37	Waste storage, treatment or disposal – storing, treating, reprocessing or disposing regulated waste including operating a sewage treatment facility with on-site disposal facilities.

Note: Under Section 371 of the EP Act, the owner or occupier of land must notify EHP within 22 business days of becoming aware of the notifiable activity having occurred or going to occur on the subject land.

2.2.3.2 Regulated and Hazardous Waste Dam

The final EA approved for the Project will include conditions that require the Proponent to have the consequence category of structures which are dams or levees constructed as part of the Project (EHP, 2016a). The hazard assessment will determine whether a structure is a 'regulated structure' for the purpose of the EA. Assessments are carried out by a 'suitably qualified and experienced person' in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (the Manual) (EHP, 2016b).

Structures may be assessed using the Manual as being in one of three consequence categories: low, significant or high. This consequence category is based on its potential impact to humans, livestock, the environment or general economic loss in the event the structure overflows or fails. Dams are automatically classified as high or significant hazard dams if the dam wall exceeds a height of 10 metres (m) or the quality of the stored water exceeds EHP's contaminant concentration criteria and minimum volume requirements. Where categorised as a significant or high consequence, the structure is referred to as a regulated structure.

Regulated dams must be able to withstand seasonal rainfall events without releasing contaminants from the dam in an unauthorised manner. A minimum available storage, called a design storage allowance, is required to be estimated for regulated dams in accordance with the Manual, in order to accommodate seasonal rainfall to a specified annual probability. Onsite water management must allow for and provide the design storage allowance volume in each regulated dam, going into each new wet season (that is, on the 1 November each year). Regulated dams are also assigned mandatory reporting levels, which if volume reaches this level, notification must be provided to EHP. Regulated structures will require certified design plans to be submitted to the administering authority demonstrating compliance with the Manual requirements. Such structures will be subject to annual inspection and reporting by a suitably qualified and experienced person. Regulated dams also require details to be entered in a register of regulated dams kept by the holder of the authority and an electronic copy provided annually to the administering authority (EHP, 2016a).

As this Project includes a number of structures which are likely to be assessed as regulated, such as mine affected water storages and possibly levees, the applicable model conditions for regulated structures would be applied to the EA.

If a regulated dam also meets the definition of a 'referable dams' pursuant to the *Water Supply (Safety and Reliability) Act 2008*, duplication of failure impact assessment is not required as there is an exemption from the referable dams in the Act for 'hazardous waste dams' and definition of the term 'hazardous waste dams' largely overlaps with 'regulated dams' under the Manual.

2.2.3.3 Subordinate Legislation

The EP Act has a range of subordinate legislation which assists in achieving the objective. The EP Act is supported by the following subordinate environmental protection policies (EPPs):

- Environmental Protection (Air) Policy 2008 (EPP (Air));
- Environmental Protection (Noise) Policy 2008 (EPP (Noise)); and
- Environmental Protection (Water) Policy 2009 (EPP (Water)).

Where relevant impacts could occur for this Project, impact assessments have been undertaken having due regard to the EVs specified in each EPP.

Environmental Protection (Air) Policy 2008

The objective of the EPP (Air) is to achieve the object of the EP Act in relation to Queensland's air environment. To achieve this objective, the EPP (Air) provides a framework for:

- Identifying EVs to be enhanced or protected;
- Specifying air quality indicators and goals to protect or enhance the EVs; and
- Providing processes which manage the air environment and involve the community in achieving air quality goals that best protect Queensland's air environment.

Air quality values of the Project area, potential impacts from the Project and management of those impacts will be addressed in the Project EIS.

Environmental Protection (Noise) Policy 2008

The objective of the EPP (Noise) is to achieve the object of the EP Act in relation to Queensland's acoustic environment. The EPP (Noise) provides a framework for:

- Identifying the EVs to be enhanced or protected;
- Stating acoustic quality objectives for enhancing or protecting the EVs; and
- Providing a framework for making consistent, equitable and informed decisions about the acoustic environment.

The acoustic values of the Project area, potential impacts from the Project and management of those impacts will be addressed through the Project's EIS.

Environmental Protection (Water) Policy 2009

The EPP (Water) establishes a process for identifying EVs to be protected and states standards for water quality in support of those values. The EPP (Water) provides a framework for:

- Identifying EVs and management goals for Queensland waters;
- Stating water quality guidelines and objectives to protect or enhance the EVs;
- Providing a framework for making consistent, equitable and informed decisions about Queensland waters; and
- Monitoring and reporting on the condition of Queensland waters.

Potential impacts on surface water and groundwater and the management measures will be addressed in the Projects EIS.

2.2.4 Regional Planning Interests Act 2014

The *Regional Planning Interests Act 2014* (RPI Act) replaced the *Strategic Cropping Land Act 2011* on the 13 June 2014. The RPI Act seeks to manage the impacts from resource activities, and other regulated activities through protecting:

- Living areas in regional communities;
- High-quality agricultural areas from dislocations;

- Strategic cropping land (SCL); and
- Regionally important EVs.

Under the RPI Act, an approval is required when a resource activity or regulated activity is proposed in an area of regional interest. Areas of regional interest are identified as:

- Priority living areas (PLAs);
- Priority agricultural areas (PAAs);
- Strategic cropping areas (SCAs); and
- Strategic environmental areas (SEAs).

SCL is mapped over the area where the TLF Options 1 and 2 are proposed; however, review of aerial photographs dating to the late 1990 show no evidence of cropping within this area. No approval under the RPI Act is anticipated for the Project.

2.2.5 Environmental Offsets Act 2014

The *Environmental Offsets Act 2014* (EO Act), *Environmental Offsets Regulation 2014* and the Queensland Government Environmental Offsets Policy provide a streamlined framework for environmental offset requirements. Offsets are required where there is an unavoidable impact on significant EVs. In addition, an environmental offset can only be required if impacts from a prescribed activity constitute a significant residual impact as identified through the following guidelines:

- The State guideline that provides guidance on what constitutes a significant residual impact for Matters of State Environmental Significance (MSES);
- The Commonwealth Significant Impact Guidelines for what constitutes a significant residual impact on MNES; and
- Any relevant local government significant impact guideline for Matters of Local Environmental Significance (MLES).

The Queensland Environmental Offsets Policy provides a decision support tool to enable administering agencies to assess offset proposals in accordance with the EO Act. An environmental offset may be required as a condition of approval where the activity is likely to result in a significant residual impact on prescribed environmental matters. The Significant Residual Impact Guideline issued in December 2014 is used for consideration of all potential offset requirements for MSES, for applications made under the EP Act. It is used to determine if a residual impact from a prescribed activity is significant. Offsets may be delivered through a variety of manners including financial settlement offsets, proponent driven offsets and a combination of these approaches.

To avoid duplication with offsets required under the EPBC Act, the policy provides that the administering agency must consider other relevant offset conditions for the same or substantially the same prescribed impact. If duplicating conditions are imposed, it allows the Proponent to remove the duplication.

2.2.6 Water Act 2000

The *Water Act 2000* (Water Act) provides a structured system for the planning, protection, allocation and use of Queensland's surface waters and groundwater. Under section 808 of the Water Act, a person must not take, supply or interfere with water unless authorised. The Water Act was amended in 2016 to require all mining activities to be assessed and approved for the take of incidental water extracted during operations. The EIS assessment will be used to inform an application for a Water Licence.

The take from overland flow is regulated by subordinate legislation by the relevant Water Resource Plan. There is no current right to water provided under the MR Act for water taken or diverted in the course of a mining activity (s 235(3)). The Project area lies wholly within the Styx Catchment (Queensland river basin 127), a small catchment forming part of the Fitzroy River Natural Resource Management region, which discharges into the Coral Sea adjacent to Rosewood Island (in the vicinity of the Project). No water resource plan is in force over the catchment. As such, no permit is required by the Project to interfere with overland flow.

Groundwater under the Project area is regulated under the Water Act. According to the Australian Natural Resources Atlas (ANRA, 2009), the Styx Basin is not covered by any Groundwater Management Unit (GMU), and the area is also characterised as Unmanaged-001 (i.e. not a managed unit) by the National Water Commission (2005). The Project is not located within a declared sub-artesian area or a groundwater management area.

Water for the construction and operation of the Project will be sourced from an external supply and trucked to the site. Once operational water will be sourced from a number of options currently under evaluation.

Interfering with a Watercourse

A number of watercourses intersect the Project area and are subject to the provisions of the Water Act if interfered with. Placing fill or excavating in a watercourse, as required for works associated with construction of haul roads, bridges and culverts require a Riverine Protection Permit (RPP). A general exemption for this permit has been granted for resource holders where the works are authorised by an EA and comply with the guidelines for Riverine protection permit exemption requirements' WSS/2013/726, Version 1.01.

No diversions will occur to the Tooloombah Creek or Deep Creek as a result of the Project.

The guideline for Works that Interfere with Water in a Watercourse – Watercourse Diversions (DNRM, 2014) outlines the considerations which must be satisfied in the assessment of the EA. As such no additional approvals under the Water Act are anticipated for watercourse diversions or realignments.

2.2.7 Coal Mining Safety and Health Act 1999

The object of the *Coal Mining Safety and Health Act 1999* (CMSH Act) is to protect the health and safety of people at, or who may be impacted by, a coal mine and to monitor and ensure that the risk of injury or illness is at an acceptable level. The Proponent is required to comply with the obligations and approvals of the CMSH Act and *Coal Mining Safety and Health Regulation 2001* (CMSH Regulation) for the Project. In particular, the Project will require approval and documentation including:

- Notification to regional inspector of mine operation commencement (ss 49-50, CMSH Act);
- Documentation of management structure (ss 51 and 55 CMSH Act);
- Documentation meeting the requirements for underground mines (ss 60-61, CMSH Act and Chapter 4, CMSH Regulation);
- Safety Health and Management System (s 62, CMSH Act);
- Principle hazard management plan and standard operating procedures (ss 63-64, CMSH Act);
- Records and reporting (ss 65-69 CMSH Act); and
- Hazardous substance register and standard operating procedure (ss 55-56, CMSH Regulation).

The EIS will outline the Proponent's health and safety obligations and commitments for the Project incorporating the requirements detailed in the CMSH Act, CMSH Regulation and the *Mineral Resources Regulation 2003*.

2.2.8 Work Health and Safety Act 2011

The purpose of the *Work Health and Safety Act 2011* (WH&S Act) is to provide a regulatory framework for workplace health and safety that is consistent with national policy. Under Schedule 1, Part 2, the WH&S Act does not apply to coal mines regulated under the CMSH Act.

For any operations or activities outside of the Project area, the full provisions of the WH&S Act apply.

2.2.9 Mineral and Energy Resource (Common Provisions) Act 2014

The *Mineral and Energy Resources (Common Provisions) Act 2014* (MERCP Act) and the *Mineral and Energy Resources (Common Provisions) Regulation 2016* (MERCP Regulation) commenced on the 27 September 2016. The MERCP brings together provisions relating to dealings, caveats and associated arrangements, private and public land access and the maintenance of the resource authority register. The MERCP Act includes the introduction of opt-out agreements which states that landholders cannot be forced to enter into an opt-out agreement by resource companies, with opt-out agreement forms now available.

The MERCP Act includes a framework for the management of overlapping coal and coal seam gas resource authorities, which regulates both the resource authority and safety and health requirements.

2.2.10 Other Queensland Legislation

- *Aboriginal Cultural Heritage Act 2003;*
- *Sustainable Planning Act 2009;*
- *Nature Conservation Act 1992;*
- *Vegetation Management Act 1999;*
- *Transport Infrastructure Act 1994;*
- *Land Act 1994;*
- *Biosecurity Act 2016;*
- *Fisheries Act 1994; and*
- *Forestry Act 1959.*

2.2.10.1 Aboriginal Cultural Heritage Act 2003

The *Aboriginal Cultural Heritage Act 2003* (ACH Act) contains provisions for identifying significant Aboriginal cultural heritage and protecting it from development, including:

- The requirement to comply with a duty of care towards Aboriginal cultural heritage;
- The requirement to notify the existence and location of Aboriginal human remains;
- The establishment of an Aboriginal Cultural Heritage Database; and
- The establishment of a Register of Aboriginal Cultural Heritage.

The ACH Act requires that, when carrying out an activity, all reasonable and practicable measures are taken to ensure that the activity does not harm Aboriginal cultural heritage. This is referred to as the cultural heritage duty of care.

The Proponent will commence negotiations with the relevant Aboriginal parties which when finalised will govern management of Aboriginal cultural heritage within the Project footprint.

2.2.10.2 Sustainable Planning Act 2009

The *Sustainable Planning Act 2009* (SP Act) is Queensland's principal planning legislation and it provides a planning framework and development assessment system for Queensland. Activities within the ML are largely exempt from the requirements of the SP Act through the exemption within the MR Act outlined above and further specific exemptions within *Sustainable Planning Regulation 2009* (SP Regulation). The relevant sections of the SP Regulation for the Project are:

- Schedule 4, table 5, item 2 makes all aspects of development for a mining activity to which an EA (mining activities), under the EP Act applies, exempt from development under a local government planning scheme;
- Schedule 3, Part 1, table 2, item 1 excludes development for a Material Change of Use (MCU) for an ERA for a mining activity from assessable development; and

- Schedule 24, Part 1, item 6 excludes clearing of native vegetation for a mining activity from assessable development for the purposes of Schedule 3, Part 1, Table 4, Item 1.

Section 632(4) of the SP Act also stipulates that local government authorities and State agencies cannot levy infrastructure charges, for trunk infrastructure for works or use of land authorised under the MR Act.

The State Planning Policy (SPP) is a statutory instrument prepared under the SP Act that relates to matters of Queensland interest. The SPP applies to a range of circumstances under the SP Act, including for development assessment and when proposed new planning schemes are made or amended. The SPP is applicable to assessable development within Queensland. The provisions of the SPP may also be considered under the standard criteria of the EP Act which includes matters of State interest, as such the EIS will consider the relevance of the SPP to the Project.

The relevant State interests to the Project which are managed under the SPP are:

- Biodiversity - MSES - Regulated vegetation and MSES - Regulated vegetation (intersecting a watercourse); and
- Water Quality - Climatic regions - stormwater management design objectives.

2.2.10.3 Nature Conservation Act 1992

In broad terms, the objective of the *Nature Conservation Act 1992* (NC Act) is the conservation of nature (plants and animals) within Queensland. Specifically, the NC Act seeks to gather relevant information, identify critical habitat areas, manage protected areas, protect wildlife and promote ecologically sustainable development. The NC Act has 10 subordinate regulatory instruments in the form of regulations, conservation plans and notices. Of relevance to the Project is the *Nature Conservation (Wildlife) Regulation 2006* which categorises flora and fauna species as extinct in the wild, endangered, vulnerable, near threatened or of least concern. Also listed is international wildlife and prohibited wildlife.

The NC Act will play an important role in approvals for the Project by providing legislative guidance in respect to the conservation and protection of flora and fauna deemed to be of State significance. Under the NC Act, permits for the movement of protected animals and the clearing of protected plants are required and a Species Management Program must be approved when interfering with native fauna habitat and breeding places. Initial surveys have not identified any protected plants or critical breeding places of protected species. Further assessment will be undertaken as part of the EIS.

2.2.10.4 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) regulates the conservation and management of vegetation communities and provides protection for regional ecosystems (RE) classified as 'endangered', 'of concern' or 'least concern' under the VM Act. The clearing of native vegetation for the Project will be exempt from the provisions of the VM Act under Schedule 24 Part 1, Item 1 (6) of the SP Regulation where clearing occurs within the Project's mining lease areas for a mining activity. Clearing of vegetation outside of the mining lease will not be exempt.

2.2.10.5 Transport Infrastructure Act 1994

The *Transport Infrastructure Act 1994* (TI Act) encourages effective integrated planning and efficient transport infrastructure management for the planning and management of road, rail and air infrastructure. Approvals under this Act will be required for any upgrades to State Controlled Roads (SCR) and SCR intersections (i.e. the Bruce Highway to enable access to the north pit from the south pit). The subsidiary regulations include the *Transport Infrastructure (Rail) Regulation 2006* and *Transport Infrastructure (Ports) Regulation 2005* which prescribe requirements when using rail and port infrastructure.

2.2.10.6 Land Act 1994

The *Land Act 1994* (Land Act) provides a framework for the allocation of State land as leasehold, freehold or other tenure and its subsequent management. Under the Land Act, permits to occupy are required for the occupation of a reserve, road or unallocated State land. Where electricity, water, or other infrastructure is to be developed on unallocated State land, reserves or roads, a Permit to Occupy will be required. A permit to occupy entitles the holder to non-exclusive possession of the land. In addition, development on any leasehold or other state land requires the consent from DNRM as the landholder.

Section 98 of the Land Act provides that an application can be made to DNRM to permanently or temporarily close a road. During the mine construction and operation, the existing road easement traversing the mine site will be required to be temporarily or permanently closed or realigned. It is noted that is reserve is not currently used as a road. If an application to temporarily close a road is approved, a road licence will be issued to the applicant that grants exclusive occupation of the road.

Upgrades to existing road easements will be assessed via the EIS and the Proponent will obtain any required approvals prior to works being carried out.

2.2.10.7 Biosecurity Act 2014

The objectives of the *Biosecurity Act 2014* (Biosecurity Act) are to provide biosecurity measures against pests, disease and contaminants. The Biosecurity Act has replaced the many separate pieces of legislation that were used to manage biosecurity, including the superseded *Land Protection (Pest and Stock Route Management) Act 2002*. The Biosecurity Act is used to manage risks associated with emerging, endemic and exotic pests and diseases that can impact on industry, the built environment, animals, biodiversity, and the natural environment, tourism and infrastructure services. Pest species will be managed under the Act.

2.2.10.8 Fisheries Act 1994

The main purpose of the *Fisheries Act 1994* (Fisheries Act) is to provide for the use, conservation and enhancement of the fish resources and habitats as a way to apply and promote the principles of Ecologically Sustainable Development (ESD). It regulates the taking and possession of specific fish, removal of marine vegetation, the control of development in areas of fish habitat and listed noxious fish species. An approval is not required for waterway barrier works within waterways as mining activities are exempt from the Fisheries Act. Where activities are outside of the ML, approvals for waterway barrier works will still be required. All waters of the state are protected against degradation by direct or indirect impact under s125 of the EP Act. If litter, soil, a noxious substance, refuse or other polluting matter is on land, in waters or in a fish habitat and the polluting adversely affects fisheries resources or habitat then penalties apply.

2.2.10.9 Forestry Act 1959

The *Forestry Act 1959* (Forestry Act) provides for, among other things, the sale and disposal of quarry material and commercially valuable timber on certain State lands. Forest products and quarry materials on all State land and on some freehold lands where these products and materials are reserved to the State are the property of the State. State-owned forest products and quarry material under the Forestry Act are administered by the Department of Agriculture and Fisheries. The vast majority of the Project is located on freehold land with no forest products or quarry materials reserved to the State and as such no authorities are required under the Forestry Act. However, sections of the haul roads to TLF Option 1 and Option 2 are within a boundary watercourse and the identification and clearing of timber of commercial value will be discussed with EHP and the Department of Agriculture and Fisheries prior to undertaking any clearing. The MR Act provides the right to quarry material to holders of a ML. No quarrying is proposed to occur outside any ML as part of the Project.

3 Project Description

3.1 Overview

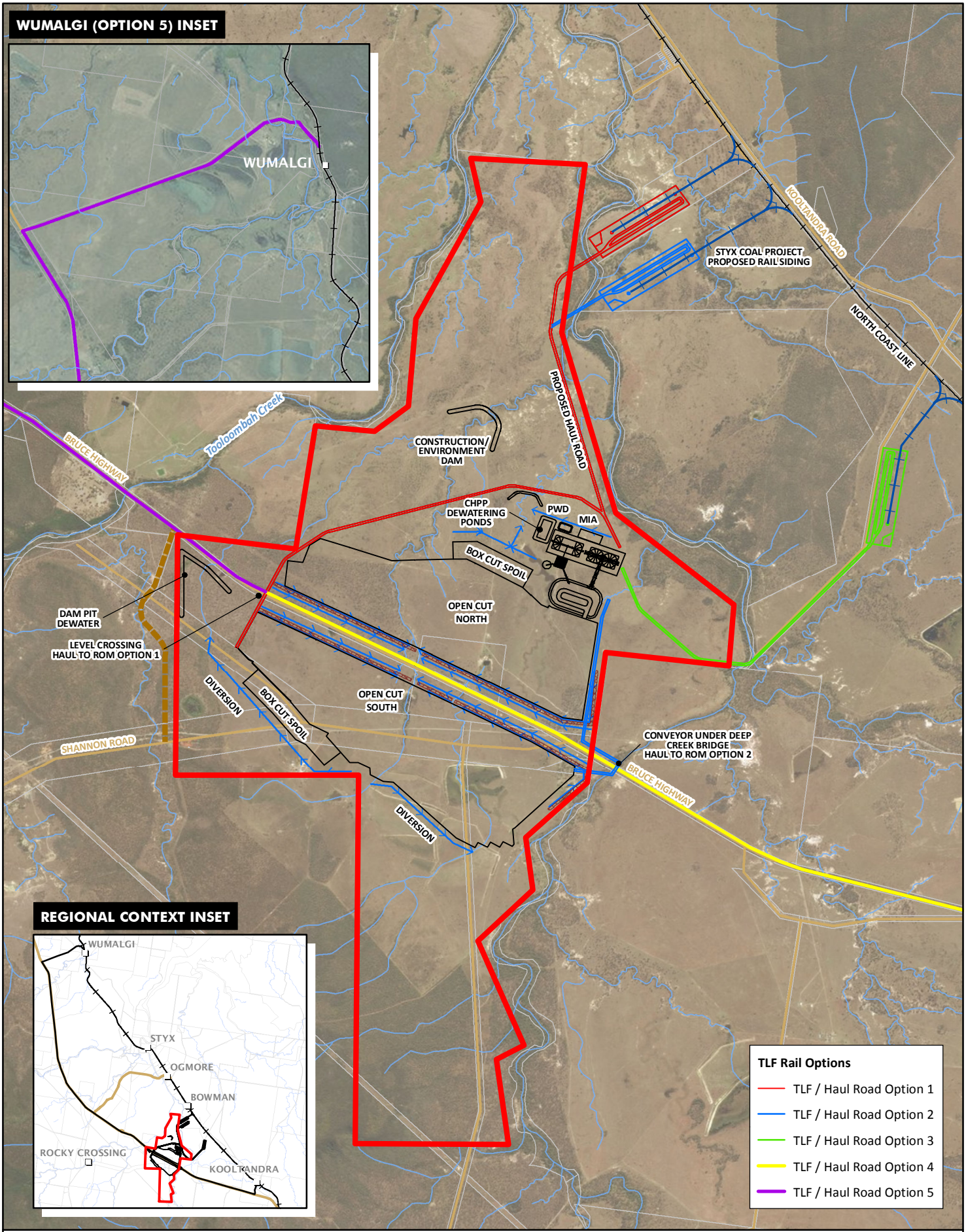
The proponent has identified a potential resource of multiple coal seams within the proposed MLA area, confirming the presence of high volatile, low sulphur, thermal coal and semi soft coking coal. To access these resources, two open pit excavations will be developed with an anticipated rate of extraction of between 2 Mtpa to 5 Mtpa, with options of increasing up to 10 Mtpa ROM coal. The ROM coal will be crushed and processed at an expected yield of 95% for HGTC and 80% for SSCC. Both products are for export to international markets.

The Project has identified total inferred/indicated resources within the MLA area of 203 million tonnes Joint Ore Review Committee (JORC). Ongoing and additional infill drilling is progressing within the Project area where, over time, the Project expects to provide sufficient coal quality data to categorise additional mineable areas to enable extension of the mine life.

The proposed coal mine layout and associated infrastructure is shown on Figure 3-1. The key components of the Project include:

- Open cut mine pits;
- CHPP;
- Haulage and site access;
- Rail facilities and Train Loadout Facility;
- Port facilities;
- Mine Industrial Area;
- Water management system including pit dewater dams, environment and process / contaminated water dams;
- Fuel and oil, explosives storage facilities;
- Sewage treatment plant (STP); and
- Associated infrastructure.

While detailed mine design has not yet been completed, conceptual details are provided in the following sections. There currently exist five rail connection options (refer Section 3.5.4) and two haulage options (haul road or conveyor) (refer Section 3.5.3). The ultimate rail connection option is contingent on outcomes of negotiations for land access for the TLF. The haulage route is contingent on whether a level road crossing or conveyor under the existing road bridge is preferable. These options will be investigated further and the final arrangement and associated impacts detailed in the EIS phase of the Project.



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DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2016

Figure 3-1
Mine layout

CDM Smith

3.2 The Resource

The Styx Basin is a small Early Cretaceous intra-cratonic sag basin, covering some 300 km^2 onshore and 500 km^2 offshore. The known strata of the basin are referred to as the Styx Coal Measures and consist of quartzose, calcareous, lithic and pebbly sandstones, pebbly conglomerate, siltstone, carbonaceous shale and coal. The environment of deposition was freshwater, deltaic to paludal with occasional marine incursions. The Styx Coal Measures outcrop on the western edge of the Styx Basin have an average dip of 5-60^o to the east (Arrow Energy, 2005).

The geology in the MLA area is characterised as Quaternary alluvial deposits overlying the Styx Coal Measures (DNRM&W, 2006). These in turn overly a progression of Late Carboniferous to Late Permian deposits of the Back Creek Group (Carmilla Beds and Glenprairie beds, from shallowest to deepest). Geological information for the proposed mining area broadly confirms the above geology (largely mudstone, sandstone and siltstone, with conglomerate and claystone, along with the coal deposits).

The stratigraphy of the Project area is shown at Figure 3-2. The coal seams are relatively shallow, and the average cumulative thickness of the full sequence of coal (Grey to V_L2 seams) is approximately 6 m, contained within a sequence of approximately 120 m of coal bearing strata.

The coal seams generally dip to the east in the area west of the Bruce Highway, with the Violet seam, the lowest coal seam in the sequence, sub-cropping in the western part of EPC1029. The bedding structure is currently interpreted to be a syncline, the axis of which runs northwest/southeast through the Project area.

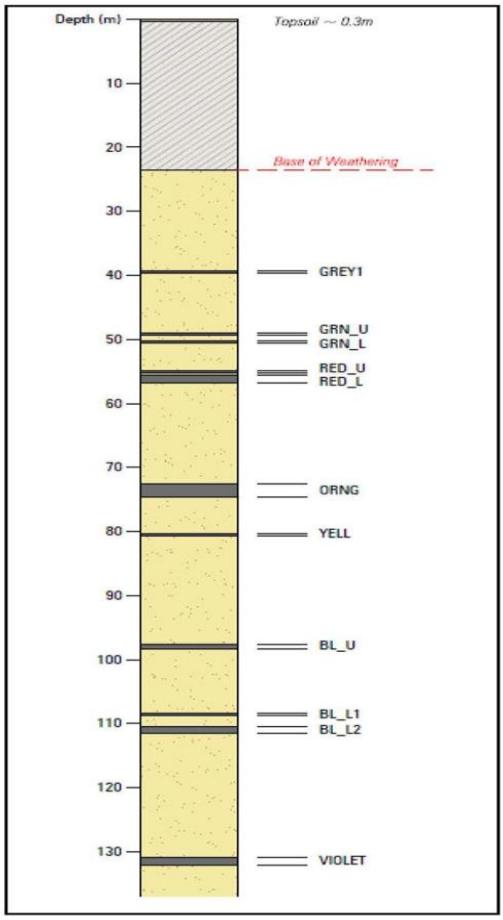


Figure 3-2 Typical stratigraphy of the Project area

The Proponent has identified a potentially viable resource of multiple coal seams within the Styx Basin, confirming the presence of HGTC and SSCC. The coal seams attain a maximum cumulative coal thickness of approximately 15 m in the centre of the Project area where all seams are present, and local seam thickening is evident.

Fairway Coal has undertaken an extensive exploration drilling programme within the Project area from late 2010 through to December 2014. Data from 137 exploration drill holes, including 67 JORC Points of Observation, have been used in coal estimates.

The Project is estimated to contain a total coal resource of 203.2 Mt, with 34.3 Mt of indicated resource and 169 Mt of inferred category resource. A total of 60 Mt of resource is at a depth less than 75 m from the surface. The Proponent has to date identified, from drilling, an inferred JORC resource of 93 Mt in the MLA area (north and south pits) (refer to Figure 3-1) of MLA 80187. The aforementioned figures are compliant with the Australian Institute of Mining and Metallurgy (AUSIMM) standard established by the JORC.

Coal quality has been developed and verified through a variety of coal quality analysis reports. Exploration drilling, analysis and reporting commenced during 2011 and continued through to 2014. The initial reports completed by HDR Salva in December 2011, and the later drilling and final analysis completed by ALS Coal Division in 2014, describe Styx coal as low ash, high volatile SSCC.

3.3 Land Use and Tenure

The Project is in the Brigalow Belt Bioregion of Central Queensland, and the Capricorn Coast region. This is described as a dry, flat to rolling landscape with remnant grasslands and forest areas, and includes Rockhampton and Gladstone, together with smaller areas of coastal development. Land use over the Project area is predominately rural grazing lands, as indicated on Figure 3-3.

The MLA area incorporates three separate freehold allotments; a road reserve, easement and single parcel of leasehold land. The TLF and ancillary infrastructure options outside of the MLA area are proposed to be located on separate freehold and leasehold allotments. Land tenure and ownership details for these properties within the MLA area and the five TLF options are shown in Table 3-1. The land parcels and land type within and surrounding the Project area is shown at Figure 3-4.

Table 3-1 Land tenure affected by the Project

Tenement	Lot on Plan	Land Type	Property	Held by	Associated Project Infrastructure
ML 80187	Lot 10 on MC493	Freehold	Mamelon	QNI Metals Pty Ltd	Mining, overburden dumps, ROM stockpile, haul roads. Possible MIA, CHPP and TLF
	Lot 11 on MC23	Freehold			Mining
	Lot 9 on MC496	Freehold			Mining
	Lot 1 on RL3001	Lands Lease			Mining
	AMC529	Easement			Nil
	AAP16117	Road Reserve	-	Livingstone Shire Council	Mining
Rail Options Tenure	Lot 119 on CP900367	Freehold	Oakdean	David Theodorus Hauwert and Andrea Maree Hauwert	Option 1 - TLF and ancillary infrastructure

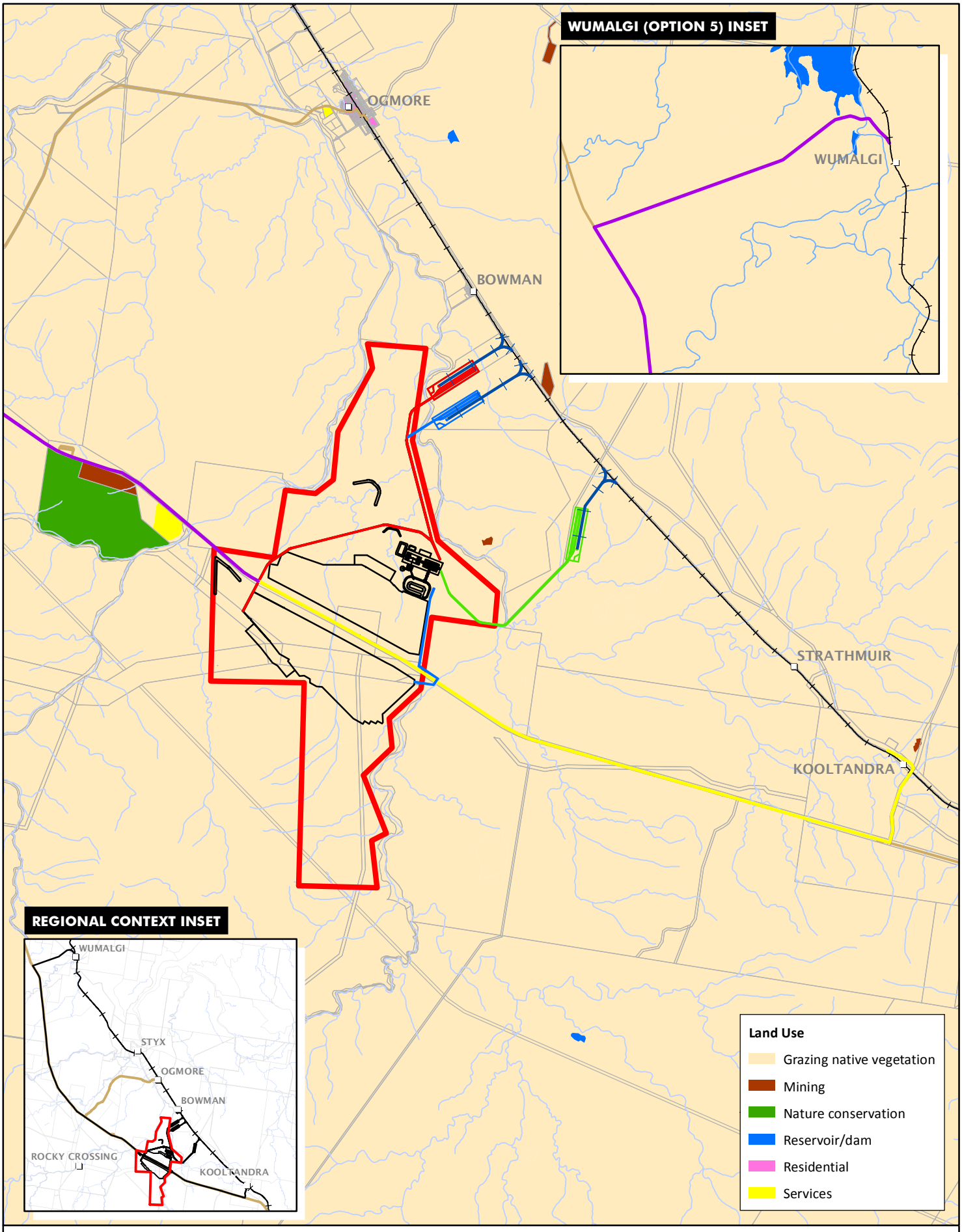
Tenement	Lot on Plan	Land Type	Property	Held by	Associated Project Infrastructure
	Lot 4973 on SP275117	Leasehold	Bowman	Noel Neville Conrad and Rosslyn Ann Conrad	Option 2 - TLF and ancillary infrastructure
	Lot 9 on MC230	Freehold	Strathmuir	Russell Charles Smith, Elizabeth Joan Smith and Edward George Smith	Option 3 - TLF and ancillary infrastructure
	Lot 193 on MC550 Reserve.	Lands Lease	Riverview	Suzanne Margaret Cooper and Jason Charles Cooper	Option 4 - TLF and ancillary infrastructure
	Lot 561 on SP130109 and Lot 3 on RP602328	Lands Lease and Freehold	-	The State of Queensland (Represented by the Department of Transport and Main Roads)	Option 5 - TLF and ancillary infrastructure
Adjacent Land Tenure	4973SP275117	Lands Lease	-	Rosslyn Ann Conrad and Noel Neville Conrad	Nil
	4317PH491	Lands Lease	-	Edward George Smith, Elizabeth Joan Smith and Russell Charles Smith	
	19MC495	Freehold	-	Quincy's Pastoral Company Pty Ltd	
	1RP616700	Freehold	-	Quincy's Pastoral Company Pty Ltd	
	2RP616700	Freehold	-	Quincy's Pastoral Company Pty Ltd	
	85SP164785	Freehold	Brussels	Scott Robert McCartney	
	87SP164785	Freehold	Brussels	Scott Robert McCartney	
	AMC529	Easement	-	In favour of Powerlink	
	BMC529	Easement	-	In favour of Powerlink	
	11MC23	Freehold	-	QNI Metals Pty Ltd	

There are several coal tenements and a single petroleum tenement within the immediate surrounding area of the MLA. Four EPCs, including Fairway Coal's current EPC 1029, six Exploration Permits for Minerals and a single MDL adjoin the Project area. A single Petroleum Survey Licence exists to the southwest of the Project. These tenements are shown at Table 3-2 and at Figure 3-5.

Table 3-2 Mining tenements in the immediate vicinity of ML 80187

Tenement	Tenure Holder	Granted	Expires
Mining Leases			
EPC 1029	Fairway Coal Pty Ltd	20/04/2006	19/04/2016*
EPC 2268	Waratah Coal Pty Ltd	27/06/2011	26/06/2019
EPC 2128	Scorpion Energy Pty Ltd	05/02/2013	04/02/2018
EPC 2392	Civil and Mining Resources Pty Ltd	22/04/2015	21/04/2020
EPM 19574	Marlborough Nickel Pty Ltd	13/12/2012	12/12/2017
EPM 16553	Bandanna Oil Shale Pty Ltd	14/01/2008	13/01/2019
EPM 25763	Orion Gold NL	15/5/2015	13/5/2020
EPM 25703	Orion Gold NL	30/10/2015	29/10/2020
EPM 25122	Orion Gold NL	12/02/2013	12/01/2018
EPM 19825	Orion Gold NL	12/02/2013	12/02/2018
MDL 468	Fairway Coal Pty Ltd	22/1/2014	21/1/2019
ML 80187	Styx Coal Pty Ltd	15/6/2012	
Petroleum Lease			
PSL 2019	Arrow Bowen Pipeline Pty Ltd	3/03/2016	3/02/2017

* the renewal application has been submitted for this lease



Legend

- Styx Coal Project
- Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

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Date: 14/12/16
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DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

Figure 3-3
Land use

CDM Smith

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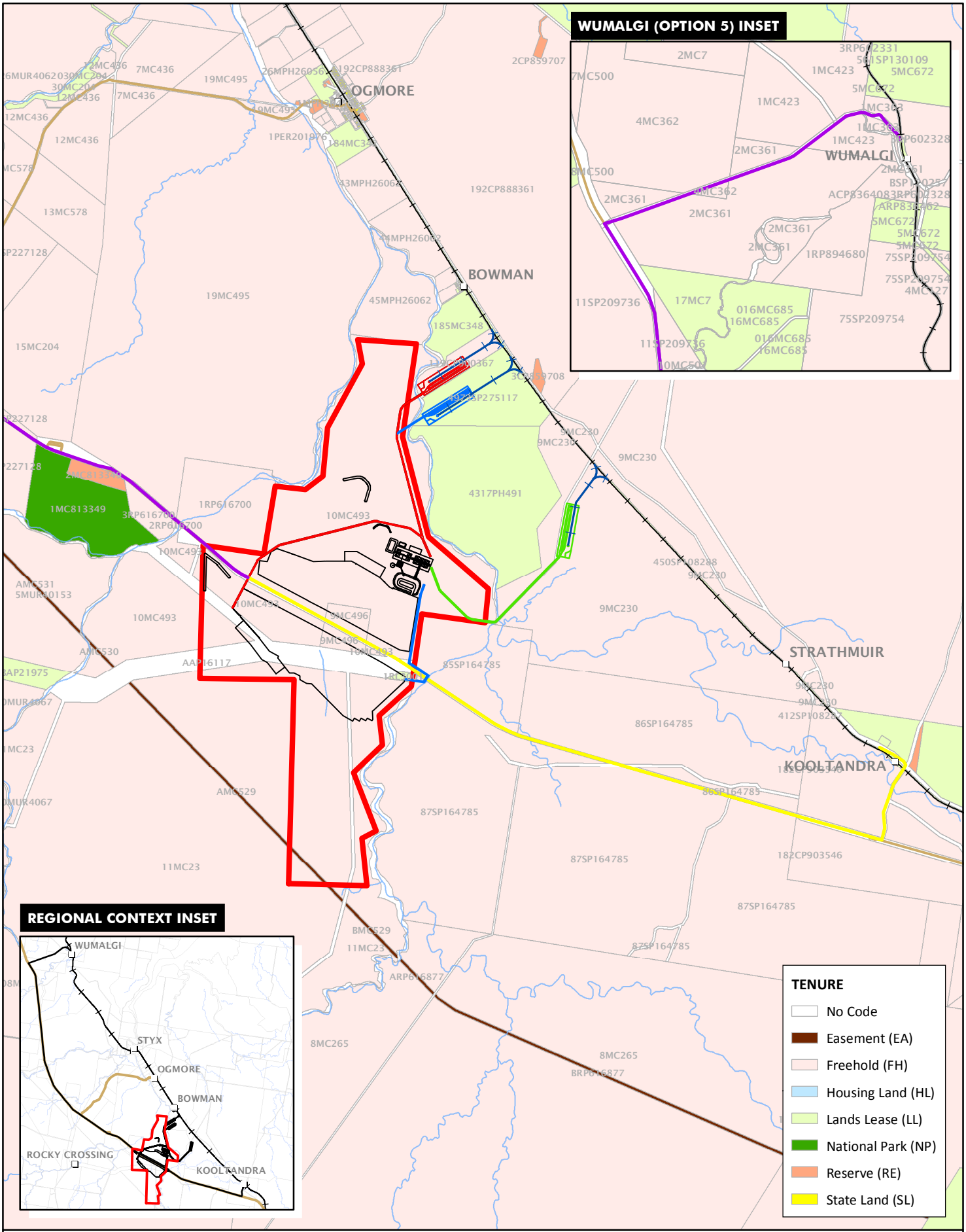

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Legend

- Styx Coal Project Mining Lease Application Area
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

Figure 3-4
Land tenure

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

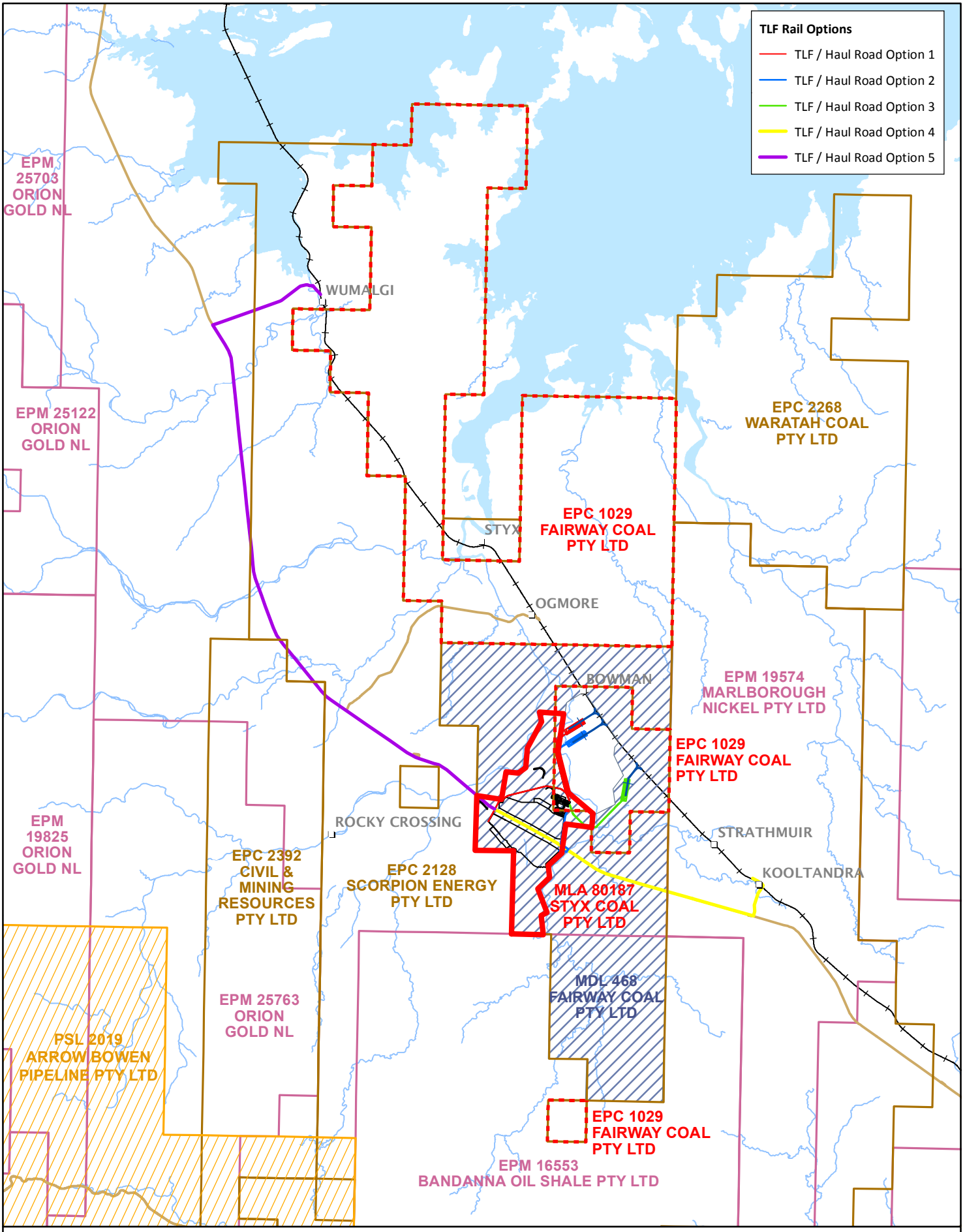


Figure 3-5
Mining tenements

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\BES150160.01 R1 tenements-petroleum&mining.mxd 12/14/2016

3.4 Employment Opportunities

The Project will require the hiring of 200 employees during construction and 250 employees during operations with an option to increase to 500 employees should operations increase to maximum throughput tonnages. The Project labour resources will be sourced from within the general local area (Marlborough, St Lawrence, Sarina, Mackay and Rockhampton) as a drive-in drive-out workforce. A small portion of the workforce is anticipated to come from outside the broader central Queensland coalfields area on a fly-in fly-out basis.

In the last two years, Queensland has seen over a quarter of the mining workforce lose jobs (over 20,000 jobs) (Swann, Ogge and Campbell, 2016). The Project will positively contribute to the local and regional areas with increased direct and indirect employment opportunities through ongoing services and support requirements.

3.5 Mine Design and Schedule

The Proponent is currently completing feasibility studies which include detailed evaluation of the most cost effective and efficient designs for the mining operation. The assessment includes evaluation of the mining operations, pit and out of pit dump designs and the associated infrastructure and MIA and TLF general arrangements. The most recent conceptual plan for the Project is shown at Figure 3-1.

The following sections describe the current plan for the Project.

3.5.1 Mining Process

The current mine plan is based on commencing construction in Q1 2018 with first production in Q2 2018, following a construction period of approximately six months.

The mine will utilise an open cut mining technique where strips or blocks will be mined in succession, thus allowing waste from one strip or block to be dumped into a previously mined out area. Waste from an initial strip or boxcut will be dumped into a predetermined out of pit dump. Stripped topsoil and box cut spoil will be stockpiled for later use in mine rehabilitation.

Two open cut pits will be developed – one either side of the Bruce Highway (south and north pits). After topsoil has been removed from a strip, the overburden waste material, where necessary, will be drilled and blasted and subsequently removed by a combination of truck/shovel, truck/excavator or dozer push methods in order to expose the top coal seam. Dozer ripping will be considered if the waste thickness is too thin for blasting.

The coal will be mined using front end loaders or small hydraulic excavators or surface miners and placed into rear dump trucks or B Double side tippers for haulage. The haul trucks will transport the coal along the strip or terrace, up a coal ramp out of the pit, then along a haul road to a ROM stockpile area located adjacent to the MIA. The coal will be dumped onto a stockpile or, if certain coal quality requirements are met, may be dumped directly into the ROM hopper where it will be crushed and conveyed to the CHPP feed stockpile ready for processing.

Mining the top seam will continue along the length of a strip or terrace until the end of the strip or terrace is reached. Once the top seam has been mined out, successively deeper coal seams will be mined in a similar fashion through to the designated basal seam, whereupon the strip will become available as a dumping destination.

3.5.2 Coal Handling and Preparation Plant

During Stage 1 of operations (Year 1-2), ROM coal will be hauled to a ROM pad where it will be crushed and screened for haulage to the TLF area as HGTC.

The Project will require a CHPP to process ROM coal delivered from the open cut excavations to achieve SSCC grade. The CHPP will be designed to accommodate 5 Mtpa ROM coal, commencing in Stage 2 of operations (Year 2). Coal will either be direct fed into the dump hopper and CHPP or transported from the ROM stockpile to the CHPP via an overland conveying system. The CHPP will remove (wash) the unwanted sediment and rock from the coal to improve the quality of coal exported to market.

The various coal seams will have dedicated raw coal stockpiles immediately preceding the CHPP. A surge bin before the CHPP will provide an opportunity for some blending, if required. It is expected that the CHPP will operate at a feed rate of around 800 tonnes per hour, operating for an average of 7,000 hours per annum. The product coal (approximately 4 Mtpa based on 80% yield and 5 Mtpa ROM coal) will be stockpiled for haulage and transfer to the TLF.

Coarse rejects and dewatered fine rejects will be transferred via haul truck and strategically mixed with overburden material in the out of pit dump or placed directly into the pit. This strategy removes the requirement of a tailings dam or out of pit co-disposal dump.

Waste water resultant from the rejects dewatering process will be drained to evaporation ponds. These evaporation ponds will be regularly emptied of solids to be mixed in-pit with overburden waste material. A network of mine water dams will treat sediment laden runoff prior to discharge to receiving waters, accept pit dewatered volumes for reuse within the CHPP and allow for discharges licenced within the EA.

3.5.3 Haulage and Site Access

ROM coal will be conveyed or hauled from the south and north pits to raw coal stockpiles located at the MIA, or dumped directly into the ROM hopper at the MIA for crushing and screening. Coal being transferred from the south pit will need to cross the Bruce Highway to access the MIA. Two options exist to cross the Bruce Highway:

- A dedicated level crossing at the northern extent of the pit shells; or
- Conveyor crossing under the Deep Creek bridge crossing.

The locations of the level crossing and conveyor crossing of the Bruce Highway is shown in Figure 3-1. Assessment of the level crossing and conveyor under bridge options is underway as part of feasibility assessments. The conveyor option is shown diagrammatically in Figure 3-6. Whilst this option avoids traffic management issues associated with the level crossing option, it presents management issues with preventing coal fines and dust entering Deep Creek as well as being located outside the MLA area.

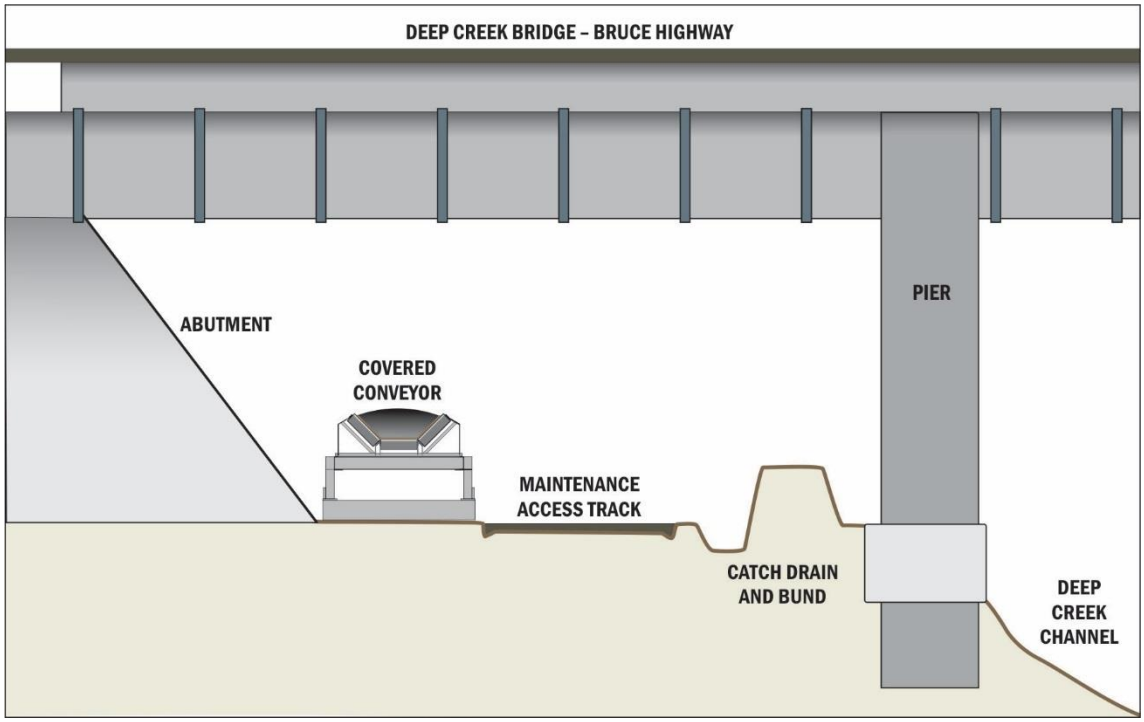


Figure 3-6 Conveyor crossing under Deep Creek road bridge

Once processed, the product coal will be transferred from the product coal stockpile, located adjacent to the CHPP, by haul truck along a dedicated haul route to a separate product stockpile at the TLF. Product coal will then be loaded onto awaiting wagons from the product coal stockpile by front end loaders.

3.5.4 Rail Facilities

There are several options being investigated at this point in time, which allows for three rail spur locations directly east of the mine site and two other rail siding loading points located near Kooltandra and Wulmagi rail sidings. All options are located and connect directly to the North Coast Rail Line. It is initially proposed to construct a rail spur at Oakdean, approximately 8 km east from MIA. The rail infrastructure area will consist of a rail spur and passing loop, stockpile area, sediment dam and haul road loop.

The rail spur will be approximately 1,500 m in length, diverging off the main North Coast Rail Line. Access to and from the rail spur will be controlled by a dedicated Queensland Rail Signalling System.

The coal stockpile area will be approximately 1 ha, capable of holding up to 100,000 t of product coal which is roughly the size of one cargo dedicated for shipping at DBCT. The stockpile area will be drained to a sediment pond, located down gradient of the site. A pump stand will be located next to the sediment pond to provide water for dust suppression of haul roads and stockpile areas.

A haul road leading from the MIA will terminate at the coal stockpile area with a truck turning loop.

The train to be used for these operations will be supplied from the rail operator. These trains have a payload of 3,100 t with an axle load of 20 t and a length of 670 m.

The port site where coal will be unloaded is the DBCT, located approximately 175 km north of Project area. The route to the DBCT requires above rail access along the North Coast Rail Line to Yukan Station (150 km north of Styx), transferring thereafter to the Goonyella Rail System, which leads to DBCT. Access to both these systems will be organised by the selected rail operator.

3.5.4.1 Alternative Train Loadout Facility Options

The Proponent is considering four other locations for the TLF (refer Figure 3-1) as part of the feasibility study that is under way.

Alternative locations for the TLF are:

- Lot 4973 on SP275117;
- Part of Lot 9 on MC230;
- Kooltandra Rail Siding, Lot 193 on MC550; and
- Wumalgi Rail Siding, Lot 561 on SP130109.

3.5.5 Port Facilities

The DBCT at the Port of Hay Point is the preferred port facility to be utilised by the Project. The DBCT is located approximately 175 km north of the Project. DBCT is operated by North Queensland Bulk Ports Corporation and has a capacity to export 85 Mtpa. The terminal is a common user facility and is being upgraded to 153 Mtpa.

Currently there is surplus capacity with current users at DBCT. Pacific National have progressed negotiations on behalf of the Proponent to secure spare port capacity with existing customers. It is proposed to utilise the spare capacity and build a 20,000 t stockpile cargo over a three-day period using the 3,100 t trains for the Project. Therefore, it is projected that the DBCT will have capacity to export the Project's product coal.

3.5.5.1 Alternative Port Facility Options

The Proponent has identified and is considering a number of potential port locations on the Queensland coast as part of the feasibility studies that are being undertaken for the Project. The other port facilities considered as part of the feasibility studies are the RG Tanna Coal Terminal and the Wiggins Island Coal Export Terminal (WICET). Both RG Tanna Coal Terminal and WICET form part of the Port of Gladstone which has eight main port facilities.

The RG Tanna Coal Terminal is located west of Gladstone and currently has a throughput of 64 Mtpa with a capacity of 75 Mtpa. There are future plans for the RG Tanna Coal Terminal to increase capacity to 90 Mtpa. The RG Tanna Coal Terminal is operated by the Port of Gladstone and, by volume, is the world's fourth largest coal export terminal. Coal is received by rail and is transported to the stockyard via 1.7 km conveyor.

WICET is located to the west of the existing RG Tanna Coal Terminal, at Golding Point. The first shipment of coal was in Q2 2015. WICET has a current throughput of 8 Mtpa with a capacity of 27 Mtpa. Feasibility studies for WICET have been undertaken for the expansion of up to 90 Mtpa. Access to WICET is immediately south of the North Coast Rail Line. A 5.6 km long overland conveyor transports coal to the stockyard.

Given the current exports per annum compared with the full operating capacity and the location of the Project to the North Coast Rail Line, both RG Tanna Coal Terminal and WICET are considered feasible port facilities to support the Project.

3.6 Additional Infrastructure

The Project will require various additional infrastructure to support the mine operation including water management system infrastructure (raw water storage, environment dams, pit sumps and pit dewatering dams, and a water treatment plant) and workers' accommodation (located off-site in Marlborough and transported by bus). There will be a centralised MIA dedicated for offices, main stores, maintenance and overhaul of mobile fleet. This area will support the two adjacent open cut pits and the CHPP. The MIA will be located east of the open cut and adjacent to the North Coast Rail Line on the east side of the Mamelon property.

Refer to Figure 3-1 for locations of the aforementioned Project infrastructure.

3.6.1 Power Supply

Various power supply options are under evaluation as a part of the feasibility studies. The base case for the Project is all mine site power requirements will be supplied via multiple on-site diesel generation units.

The power supply for the mine site will most likely be provided by 415V, three-phase diesel generators, installed at the MIA and the CHPP. The MIA will incorporate two 300KVA 415V diesel generator sets mounted in a fully bunded area adjacent to the MIA 415V Switchroom. The normal mode of operation for the generators is synchronised and connected to the load through a bus tie. The generators will be sized to provide redundancy with each generator capable of carrying the total load.

The generators will include their own diesel day tanks capable of holding sufficient diesel for a minimum of seven days' operation on full load. The generators will be hired to minimise initial capital costs and the hire company will be responsible for all repairs and maintenance.

The CHPP area will be serviced by two substations, one at raw coal area and the other at the CHPP. The raw coal substation will likely consist of one 500KVA 415V diesel generator set mounted in a fully bunded area adjacent to the raw coal 415V Switchroom. Conceptually the CHPP substation will have three 500KVA 415V diesel generator sets mounted in a fully bunded area adjacent to the CHPP 415V Switchroom. The normal mode of operation for the four generators is synchronised and connected to the load through bus ties with an interconnecting cable installed between the two substations. The generators will be sized to provide redundancy with three generators capable of carrying the total load.

Similar to the generators used at the MIA, each have their own diesel tanks capable of holding sufficient diesel for a minimum of seven days' operation on full load.

The switchrooms house the motor control centres (MCC), programmable logic controls (PLC) and instrumentation equipment, as well as the 415 V Distribution Board which supply light and power. The area lighting consists of hinged lighting towers fitted with 1,000 W floodlights.

A separate option to connect into the existing 11 kilovolt (kV) transmission line maintained by Ergon Energy which provides power to the nearby township of Ogmore is under consideration. From discussion with Ergon this 11 kV line has limited capacity to support the Project; however, depending on the final power demand needed to support the CHPP operations an opportunity to connect to the Ogmore substation may still be possible.

There is also a regional 275 kV line which crosses the southwest EPC boundary. From discussions with Powerlink (275 kV), it is not feasible to connect to this power supply. Currently there is no

transformer in the area to step down the high voltage for mine supply. Consequently, this option is no longer under consideration.

3.6.2 Water Supply

There is no raw or potable water mains in the Project area to service the Project. The township of Ogmore imports potable water to storage tanks to maintain the town's supply.

Potential water sources for the Project include the Tooloombah Creek, Deep Creek, groundwater bores (existing and newly constructed), mine dewatering dams and catchment runoff dams. The Project water supply requirements are estimated to be 825 megalitres with water usage allocated for the CHPP to process the ROM coal, dust suppression, fire protection, and potable water for the amenities. Water will be sourced and managed via the following methods:

- Type 1: Clean water runoff from undisturbed catchment areas – this water will be diverted around the disturbed area or, in some circumstance, a portion may be collected to augment the water supply for the Project;
- Type 2: Raw water sourced to supply amenities, process water for CHPP and related operations – currently Tooloombah Creek and Deep Creek, and the local alluvial groundwater aquifers are being assessed for the sourcing of makeup water;
- Type 3: Dirty runoff water from areas subject to disturbance and management of topsoil, overburden, access roads etc. contaminated by sediment only - this water will be directed through environment dam(s) prior to being reused on-site or released under controlled conditions to local waterways;
- Type 4: Contaminated water from the MIA, ROM pads, in-pit water and dewatered groundwater, and other areas subject to contamination from mining operations and coal dust or similar contaminants - this water will be contained on-site in mine water dams for reuse or disposal under EA licensed release conditions; and
- Type 5: Heavily contaminated waters and trade wastes from workshop areas, plant and infrastructure maintenance works, etc. containing contaminants such as oil and grease – the overall objective for management of these areas is to avoid any runoff being generated by undertaking these works in roofed and bunded areas, and using spill clean-up procedures to avoid runoff of these contaminants into the site water management system. Any runoff containing hydrocarbons will be contained on-site until either treated and reused or removed from the site by a licensed contractor.

Various dams will be utilised across the site to store water for use/reuse depending on the source and quality of the water. This will ensure that contaminated or sediment laden runoff will not find its way into the local waterways.

3.6.3 Telecommunications

3.6.3.1 LAN and Data Communications

A site LAN and temporary servers will be installed to service voice and data requirements during construction phase. A permanent computer and communications room will be constructed as part of the administration building at the MIA. Equipment associated with all site communications such as the satellite system, radio system and servers for voice and data transmission will be installed here. An optical fibre (OF) will run from the Marlborough exchange to the MIA and an OF backbone line will be installed between the administration building and all offices, switch rooms and buildings at the MIA, CHPP and TLF. The CHPP Supervisory Control and Data Acquisition (SCADA) control system will be interfaced by the OF backbone to provide a site wide control system with nodes at the control room, administration office and security office and gate, workshops and other authorised users as required. CCTV cameras at the security office and gate, the CHPP, TLF and ROM pad will be installed and connected to the LAN using the OF backbone cabling.

A computerised log on system, also connected to the LAN using the OF backbone, will be used by employees, contractors and visitors for recording personnel on site. This system is used for contractor management, fatigue management and identification of onsite personnel during emergency evacuations.

3.6.3.2 Radio Communications

A digital trunked radio communication system (based on TETRA technology) will be installed in stages commencing with communications for the construction phase. This initial installation will provide coverage over the entire tenement, and the highway road access for response to calls for assistance when travelling to and from site.

The initial installation will consist of a 26 m cyclonic concrete pole mast, located at the construction site, with easy access to the construction site LAN and mains power. An air conditioned relocatable building will house the electronic equipment with provision to install a microwave backbone radio LAN system at a later date when mining commences. This installation will be relocated to the MIA when construction is complete.

The second stage is an upgrade of the system to provide illumination of any working pit areas. A radio trailer with stabilised legs, a mast to ensure adequate coverage over the pit, and housing a TETRA base station will be positioned in the mining area to provide a full duplex microwave link backbone between the original site LAN at the MIA and the trailer. Power for the equipment will be provided by solar panels recharging a battery system. The system supports full duplex communications to provide full duplex private one on one and telephony calls and embraces IP technology and interfaces with the site LAN and fixed voice systems.

3.6.3.3 Fixed Voice Communications

Fixed phones using IP telephony will be connected to the LAN for integration with the satellite and radio systems.

3.6.4 Maintenance Workshops

The Project will likely require two maintenance workshop facilities; a CHPP workshop and heavy vehicle workshop. It is anticipated the workshops will be a low-cost facility, utilising off-site maintenance for larger or more complex jobs.

The CHPP workshop will likely be a 40 x 12 m building with six offices, a crib room and meeting room with room for 10 employees, and toilets. Outside will be an area designed and bunded for lubricant and solvents storage both clean and dirty.

The Heavy Vehicle Workshop will likely be a 70 x 15 x 12 m building with a floor capable of withstanding maintenance activities on all Heavy Mobile Equipment (HME) required for mining operations. The building will contain six offices, a crib room& meeting room large enough for 45 employees, and toilets.

3.6.5 First Aid / Medical Room

The First Aid centre will be in the administration building. The centre will have suitable access for any medical supplies or persons requiring access in the case of an emergency. The centre will be designed to have adequate space for a private examination room and a bathroom.

3.6.6 Bath House

It is proposed a bath house of 20 x 40 m be included on site to cater for up to 55 employees. It will have a dirty side and a clean side with showers and toilets down the middle. A separate section for female staff will be included.

3.6.7 Vehicle Washdown Bays

Washdown bays for both heavy and light vehicles are required for cleaning prior to maintenance and for adequate cleaning and washdown of vehicles and equipment before leaving site. The heavy vehicle washdown bay will be designed to allow typically 230 t payload capacity rear dump trucks to be cleaned. Nominal dimensions will be 25 x 12 m and it will contain a means of removing waste oil and reusing water. An oil-water parallel-plate separator system including storages for dirty and clean water will be installed and will be sized to strip vehicle washdown effluent and oily-water sourced from other areas of the MIA, mine, CHPP and TLF.

A light vehicle washdown bay with nominal dimensions of 10 x 5 m will be established to clean light vehicles prior to leaving site. This washdown bay will contain a means of transferring the waste water to the heavy vehicle washdown way for stripping using the installed oil-water separator facility.

3.6.8 Fuel and Lubricants Installation

A fuel and lubricant bay will be established to support the maintenance and refuelling of heavy and light vehicles. The installation will be configured to store waste oils returned from servicing of mobile equipment prior to collection for disposal.

The bulk storage capacity for diesel fuel will be 750,000 L which equates to a five-day supply. Estimates are based on three self-bunded storage tanks with pumping equipment capable of supplying separate light and heavy vehicle fuelling points. B-Double vehicles with an average load of 50,000 L will deliver fuel to the installation. It is envisaged that local storages serving fixed diesel

generating units on site will be fuelled by the site mine service vehicle. Bulk storages and filling areas will be bunded to contain spillages, with liquid waste contained for pump-out and processing through an oil-water parallel-plate separator system.

Bulk lubricant storage tanks will be appropriately sized to receive deliveries by road tanker with compartment sizes varying between 5,000 L and 8,000 L. Total lubricant consumption is estimated to average around 10,000 L per week. Tanks and fill areas will be bunded to contain spillages, with liquid waste contained for pump-out and processing through an oil-water parallel-plate separator system.

3.6.9 Waste Station

A purpose-built waste station will be built consisting of a bunded concrete pad with concrete wing walls to allow segregation of dry waste types for collection. Waste will be kept in skips or bins for transfer and disposal off-lease. Waste storage and its disposal will be managed in accordance with existing EHP waste management regulations and policies.

3.6.10 Car Parks

The main site car park will be adjacent to the administration building and be nominally 36 x 50 m with 75 parking spaces with a sealed surface. Smaller vehicle parking bays will be located outside all MIA installations as required.

3.6.11 Hazardous Materials Storage

Small volume hazardous materials (e.g. adhesives, coatings, cleaners, etc.) will be kept in purpose-built containment cupboards in accordance with current statutory requirements and the relevant safety data sheets (SDS). Purpose-built containment cupboards will be located in the vicinity of the workshops and stores.

Larger volume hazardous materials will be managed according to their respective SDS and in line with current industry standards. The design for the fuel and lubricant installation will incorporate necessary aspects for the safe storage and delivery of diesel and oils. Other hazardous items, such as any radioactive metering products, will be managed in accordance with industry guidelines and manufacturers' recommendations.

3.6.12 Drill Core Storage

All core analysis will be performed off site. On site storage will be in an enclosed shed with a concrete floor and forklift access to store the drill cores as they are produced. If required, this shed will also be used to store product samples from the CHPP before they are taken off site for analysis.

3.6.13 Crib Facilities

Appropriately designed crib facilities will be included in the administration building, CHPP office, HME workshop and mine office. Mobile Crib Hut Facilities will be provided for mining personnel operating in the field.

3.6.14 Security

The Project area will be fully enclosed with appropriate fencing to restrict unauthorised access. Access to the site will be via Automated Security Gates with closed circuit television and intercom, one on each side of the Bruce Highway, as the principal entry points for the north and south mining areas, augmented with an internal access security system. Secondary external access points will be locked at all times and will only be used by authorised mine site personnel.

Access to the site by visitors will be permissible under a strictly controlled system with defined Standard Operating Procedures. The system will incorporate procedures to ensure visitors are fully authorised to access the site, have satisfactorily completed site inductions and are registered into the site Safety and Health Management System (SHMS). The site security system will be routinely reviewed to ensure procedures remain current and continue to achieve security objectives.

3.6.15 Mine Store

A warehouse with laydown yard will house mining consumables and spares. The warehouse is anticipated to be a lockable shed of 30 x 40 m with a concrete floor and lighting with a 75 x 100 m yard attached.

The final design of the mine will allocate suitable space in specified locations as further laydown areas. These locations will be suitably designed and bunded to minimise potential impacts from overland flows.

3.6.16 Administration Building

A single storey administration building will be located adjacent to the MIA. Nominal dimensions for the administration building are 50 x 30 m. Conceptually, the administration building will contain a reception area, ten offices, a meeting room, a kitchenette, rest rooms, the first-aid centre, the security office and training room designed to seat 50 personnel.

3.6.17 Fire Fighting Systems

Installations that require specialised firefighting systems, such as the fuel and lubricants bay, will have a proprietary firefighting system incorporated into their design. A water cart will be included in the service vehicle fleet fitted with a water monitor, foam generator and fire extinguishers to fight fires that may ignite in the mine, MIA, CHPP or on haul roads.

The CHPP and MIA will have a nominal 600,000 l fire water tank and associated pumping and reticulation systems.

3.6.18 Sewage Treatment Plant

A STP will be located at the Project site to treat sewage from the Project. The STP will be a modularised shipping container housed system, designed for a maximum of 100 permanent onsite staff. The liquid waste discharged from the STP will be Class A recycled water, suitable for general surface irrigation of plants and gardens and dust suppression. Sludge

It is proposed that bio-solids (activated sludge) from the STP will be stabilised and treated, along with other organic wastes, for use as a soil conditioner as part of the Project's rehabilitation strategy. Bio-solids will be removed from the STP and taken to a purpose built bio-solid treatment area. The bio-solids will be laid on covered pads to dewater. Once dewatered the bio-solids will be

incorporated with other waste streams suitable for composting, and eventually used on site as compost. Water from the bio-solids treatment area will be captured and returned to the STP for reuse.

3.7 Offsite Infrastructure

3.7.1 Workforce Accommodation

The majority of the workforce for the Project is anticipated to come from the local area as a drive-in drive out workforce. Where personnel require local accommodation, this will be provided at the townships of Marlborough, Ogmore, St Lawrence and Clairview.

3.8 Rehabilitation and Decommissioning

As required by the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland series (DME, 1995) and the Rehabilitation Requirements for Mining Projects (EHP, 2014), the Proponent will seek to achieve:

- A landform that is physically safe for humans and wildlife, geotechnically stable and non-polluting;
- A landform with the same or similar land use suitability and EVs it had prior to the disturbance, unless other beneficial land uses are agreed with the post-mining landowners and relevant regulators;
- Progressive rehabilitation of disturbed land so that it is self-sustaining or where the maintenance requirements are safe and consistent with an agreed post-mining land use; and
- Maintaining the same or similar pre-mining water values, including surface water and groundwater quality and volume, that maintain existing ecological processes and are acceptable for existing and future users within or surrounding the site.

These goals are consistent with the principles of ecologically sustainable development as required by the EP Act.

The base case for rehabilitation is that all land disturbed by mining will be rehabilitated with native vegetation to maintain the same, or similar, environmental and cultural values as the land prior to mining. Where cattle grazing is the preferred end use, disturbed land will be rehabilitated to support appropriate vegetation.

Progressive rehabilitation will be undertaken as mining advances rather than taking place as a large operation once mining is complete. Rehabilitation of the MIA and other significant mine infrastructure will take place once mining is completed and plant and structures decommissioned.

Land not impacted by mining activities will be retained as either undisturbed native vegetation, including vegetation that will be retained within environmental buffers along waterways or land under cattle grazing. Through the retention of vegetation buffers and proposed progressive rehabilitation with endemic native species and / or appropriate vegetation for cattle grazing, no significant changes to the broad scale vegetation character of the Project area at the landscape scale are expected.

The base case for decommissioning is that all infrastructure will be completely removed, unless otherwise agreed with the post-mining land owner and accepted by the relevant Government regulators as part of the final decommissioning plan. These discussions will be held with the relevant parties well in advance of mine closure.

4 Existing Environment and Potential Impacts

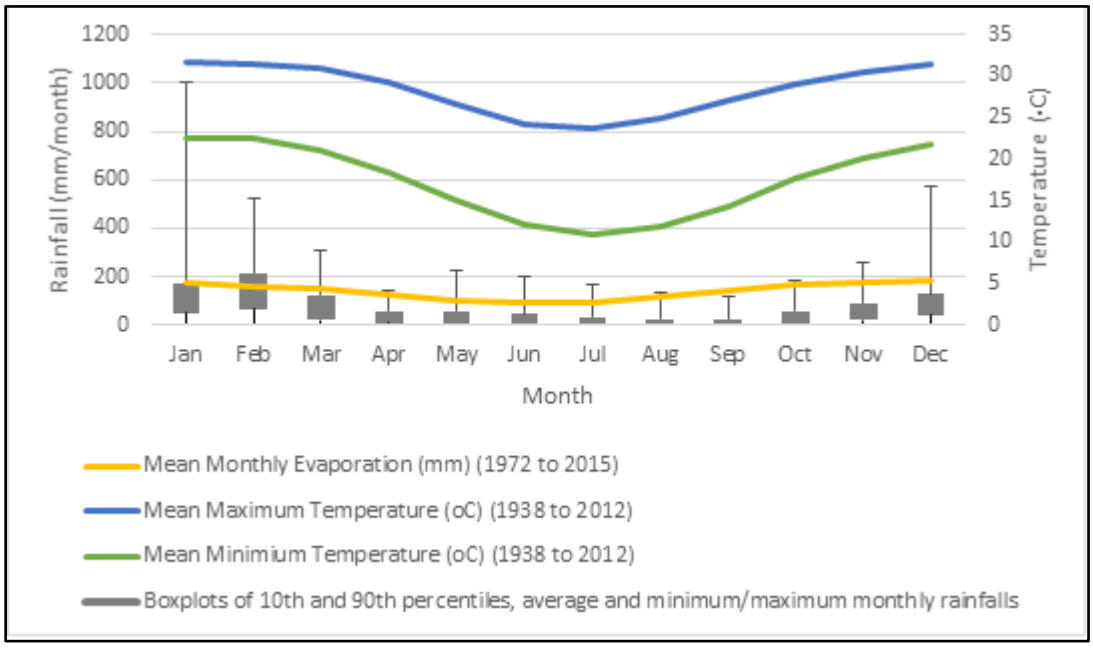
4.1 Climate

Climatic conditions in the Styx catchment are typical of a seasonally dry subtropical region. Higher rainfall in the months of November through to March corresponds with the major climatic drivers in the region being intense cyclonic low pressure influences and associated rain depressions. The overall annual rainfall is relatively low, and evaporation exceeds rainfall typically for all months.

4.1.1 Rainfall and Evaporation

Rainfall in the Styx catchment varies between 800 mm/year in the south to around 1,100 mm/year in the north (Melzer et al, 2008). A number of rainfall recording stations are located within the Styx catchment in the vicinity of the MLA area. These include Strathmuir and Tooloombah, St Lawrence Post Office and Mystery Park.

Monthly rainfall statistics from Strathmuir (BoM station no. 033189) for the period from 1941 through to 2016 is shown in Figure 4-1. These statistics show that generally November to March receives the most rain, with around 70% of the annual rainfall falling in this period. A larger variation is seen for the summer rainfall months, with January recording the largest variation (up to a maximum of 1,002 mm in January 1951).



Source: Rainfall from Strathmuir (BoM station no. 033189); Temperature and evaporation data from St Lawrence Post Office (BoM station no. 033065)

Figure 4-1 Rainfall, evaporation and temperature trends

The evapotranspiration Climatic Atlas of Australia (BoM, 2001) shows average annual evapotranspiration (areal potential) between 1,700 to 1,800 mm/yr, matched by recorded evaporation data in the area of 1,685 mm/yr (St Lawrence Post Office, BoM station no. 033065). Average evaporation exceeds average rainfall for all months as shown in Table 4-1 and Figure 4-1. However, as noted above, the large variation in rainfall means that 90th percentile rainfalls exceed evaporation during the January to March period.

Table 4-1 Monthly average evaporation and rainfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Monthly Evap. (mm)	174	158	152	129	105	90	96	115	140	167	177	183	1686
Mean Monthly Rainfall (mm)	138	145	82	36	39	31	26	19	16	40	64	104	740
Difference (Evap. – Rainfall) (mm)	36	13	70	93	66	59	70	96	127	127	113	79	946

Source: Evaporation from St Lawrence Post Office (BoM station no. 033065), rainfall from Strathmuir (BoM station no. 033189)

4.1.2 Temperature and Humidity

The annual average maximum temperature from the St Lawrence Post Office site (BoM station no. 033065) is 28.4°C, with a relatively small variation in average maximum temperatures across each month (23.8 to 31.7°C). Maximum temperatures above 40°C occur in the record in November to February, with the maximum of 44°C recorded on 5 January 1994. Mean minimum temperatures range from 10.9 to 22.5°C with a mean annual monthly minimum of 17.4°C. The minimum temperature was 2.2°C, which was recorded on 19 July 1963.

Average monthly relative humidity varies between 46% (3pm reading) and 74% (9am reading) throughout the year, with the highest values recorded at 9am between January and June, and the lowest between June and October at 3pm. These values reflect the dry conditions typical of the region.

4.1.3 Wind

The prevailing winds in the region are predominately from the south-east in the morning between January and April, and August to September, switching to south and south-east in June and July, and north-east in October to December. The afternoon winds are predominantly from the north-east, switching to south-east in June, though south-easterlies and easterlies gain progressively in prominence from November through to June, decreasing between July and October.

Average wind speeds are recorded as 10.9 km/hr at 9am, and 15 km/hr at 3pm throughout the year, with maximum wind speeds recorded over the past year of 9 km/hr and 15 km/hr at 9am and 3pm respectively. Tropical cyclones occur in the region, with gale force winds exceeding 60 km/hr and gusts in excess of 90 km/h.

4.1.4 Baseline Climate Data

An automated weather station (Weather Maestro weather system from EnvironData) was installed on the Mamelon homestead site on 14 July 2011 (Lat 22.7141°S, Long 149.6457°E). The station includes a 10 m mast, solar panel, next G telemetry and the following instrumentation:

- Wind speed sensor;
- Wind direction sensor;
- Electronic relative humidity sensor;

- Two air temperature sensors (one at 2 m, one at 10 m);
- Tipping bucket rain gauge with 0.2 mm tip;
- Solar radiation sensor; and
- Barometric pressure sensor.

The weather station is intended to operate continuously for a period of at least 12 months to provide climatic information to support air quality and noise monitoring and to provide information to the operating mining activities on the site.

4.2 Land

4.2.1 Topography and Geomorphology

Elevations across the Styx catchment range from 0 to 540 m above sea level. The area within the MLA predominantly comprises flat or undulating lands, draining via a number of smaller creeks and tributaries to the Styx River and estuary, and into the Coral Sea. The land within the Project area can be described as gently undulating.

A LiDAR survey was conducted of the original EPC 1029. Based on the LiDAR data, elevations within the MLA area vary between 4.5 and 155 m AHD, with the disturbance area located between 11.4 and 43.8 mAHD.

Based on the Capricornia Coastal Lands (CCL) program (DPI, 1995), the MLA area contains the following geomorphological land units:

- Broad, level to gently undulating alluvial plains and fans on alluvium, including some areas of gilgai microrelief (melon hole);
- Level to gently undulating plains and rises on sedimentary rocks and unconsolidated sediments, including some minor to severe melon hole;
- Undulating rises and low hills on deeply weathered sedimentary and metamorphic rocks;
- Narrow floodplains along the Styx River;
- Dissected low plateaus on gently dipping sedimentary rocks; and
- Rolling low hills and rises on hard sedimentary rocks.

4.2.2 Geology

The Styx Basin is a small Early Cretaceous intra-cratonic sag basin, covering some 300 km^2 onshore and 500 km^2 offshore. It probably developed by subsidence of the Strathmuir Synclinorium, an older feature containing Permian Bowen Basin strata (Geoscience Australia, 2008). The Styx Basin plunges to the north-northwest, with an elongate shape bounded by the half graben fault to the east and onlapping the Permian Back Creek Group to the west (Arrow Energy, 2005; Waratah Coal, 2008), but the general dip of the Styx Coal Measures sequence is to the east.

The southern part of the basin is bounded to the east by a post-depositional high-angle reverse fault, with the adjacent Cretaceous sediments folded and faulted. The known strata of the basin are referred to as the Styx Coal Measures and consist of quartzose, calcareous, lithic and pebbly

sandstones, pebbly conglomerate, siltstone, carbonaceous shale and coal. The environment of deposition was freshwater, deltaic to paludal with occasional marine incursions. The Styx Coal Measures outcrop on the western edge of the Styx Basin have an average dip of 5-60° to the east (Arrow Energy, 2005).

The geology in the MLA area is characterised as Quaternary alluvial deposits overlying the Styx Coal Measures (DNRM&W, 2006). These in turn overly a progression of Late Carboniferous to Late Permian deposits of the Back Creek Group (Carmilla Beds and Glenprairie beds, from shallowest to deepest). Geological information for the proposed mining area is also available from the bore logs of holes drilled by Fairway Coal which broadly confirms the above geology (largely mudstone, sandstone and siltstone, with conglomerate and claystone, along with the coal deposits).

4.2.3 Soils

Other than small areas associated with the foothills of Mount Bison and Mount Mamelon, the soils overlying the base geology on Quaternary alluvial sediments are predominantly Sodosols, Kandosols and Vertosols. These soils are considered to be imperfectly drained, clay loam to clay, and are associated with floodplains, areas of alluvium near rivers/creeks and flat to very gently undulating topography.

The key soils occurring within the MLA area are Sodosols, Vertosols and Kandosols, with the Sodosols being the dominant soils where drilling has occurred, bounded to the north by Vertosols and the south by Kandosols. Similarly, Sodosols, Vertosols and Kandosols are the key soils occurring at the various TLF locations. Broad soil associations across the Project area are shown in Table 4-2.

The north and south pit and initial out of pit spoil dump areas contain strongly sodic cracking clays; bleached loamy and clay loamy surface, alkaline sodic duplex soils; and bleached loamy and clay and loamy surface, alkaline sodic duplex soils, while the MIA area also contains bleached loamy and clay loamy surface, alkaline sodic duplex soils and massive fine sandy loams.

Table 4-2 Soils in the proposed MLA area

Soil landscape	ASC*	Surface area in MLA (ha)	Approx. area to be disturbed		Major soil description
			ha	%	
Blackwater	Ve, So	1132	0	-	Grey, brown and black cracking clays
Hedlow	So	1	0	-	Bleached loamy, clay loamy and silty surface, brown and grey, alkaline sodic duplex soils
Kooltandra	So	10	0	-	Bleached clay loamy and silty surface, brown and grey, alkaline sodic duplex soils
Plainview	So	3809	951	13	Black and grey, strongly sodic cracking clays, bleached loamy and clay loamy surface, brown and grey, alkaline sodic duplex soils
Rosewood	So	977	0	-	Bleached sandy and loamy surface, brown and grey, alkaline sodic duplex soils
Somerby	Ve, So	343	286	4	Black and brown cracking clays, bleached loamy and clay loamy surface, brown and grey, alkaline sodic duplex soils
Styx	Ve	230	59	1	Brown, massive fine sandy loams

Soil landscape	ASC*	Surface area in MLA (ha)	Approx. area to be disturbed		Major soil description
			ha	%	
Tooloomba	Sp	916	0	-	Bleached sandy and loamy surface, brown and grey, alkaline sodic duplex soils
Torilla	Ka	51	0	-	Red, structured gradational clay loams and uniform clays

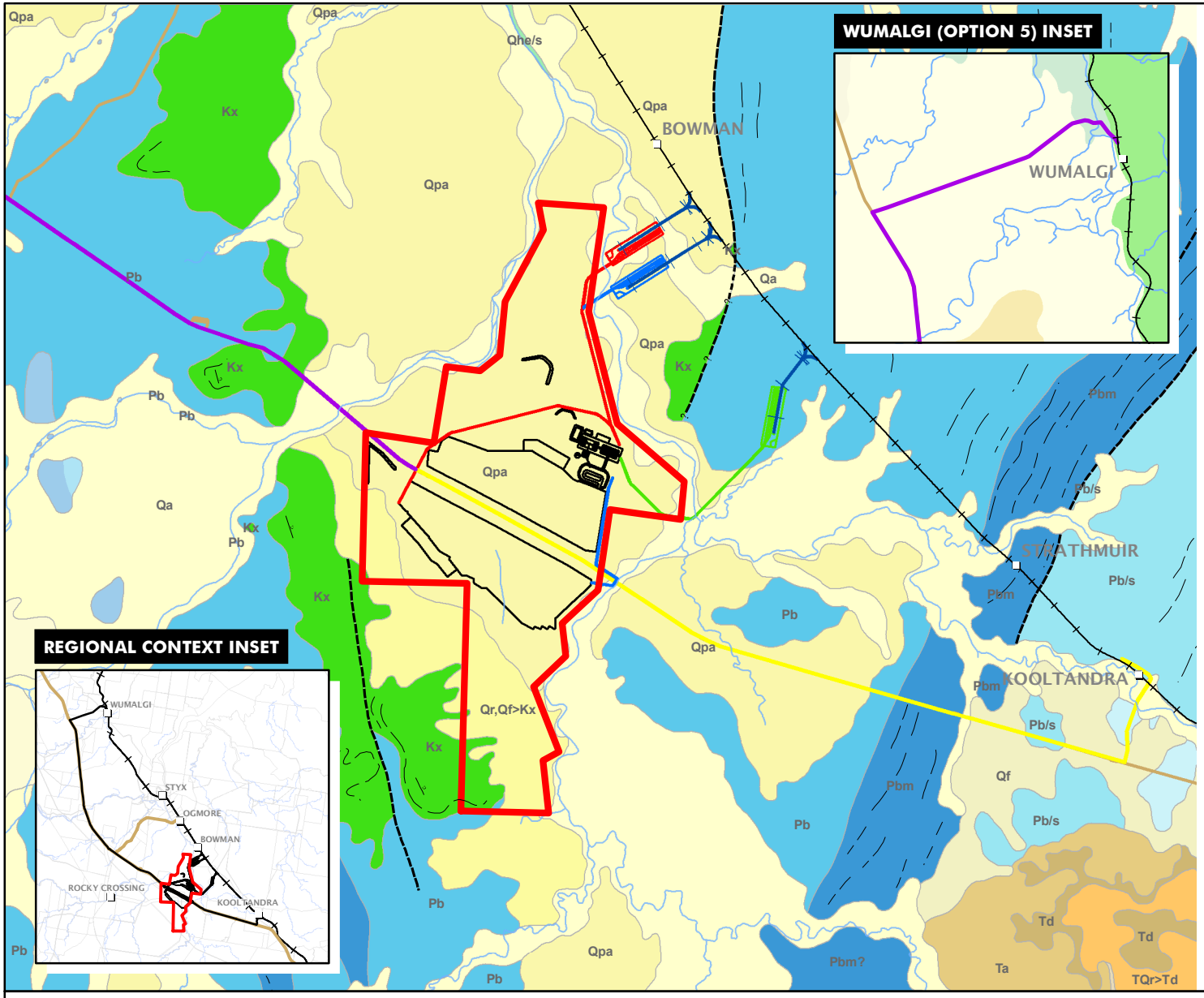
*ASC = Australian Soils Classification, Ve = Vertosol, So = Sodosol, Ka = Kandosol

4.2.3.1 Acid Sulfate Soils

Due to the close proximity of the Project area to the coast, coastal Acid Sulfate Soils (ASS) could potentially occur within the MLA. Ross (2002) undertook intrusive ASS investigations, identifying a high occurrence of ASS on the coastal plain between Tannum Sands and St Lawrence. ASS formation was recorded up to 5 mAHD in the Broadsound coast with minor occurrence of ASS situated in some landforms where the ground surface elevation is greater than 5 m (located at Stanage Bay), in particular beach ridge plains and marine couch plains.

The CSIRO (2013) National ASS Mapping describes the Project area as having a low to extremely low probability of containing ASS. Areas likely to be associated with ASS are those at low elevation (around 5 mAHD) in close proximity to coastal areas and tidal areas of the Styx River, occurring in the alluvial plains and flood plains present to the north of the MLA. The national ASS mapping (refer to Figure 4-4) shows proximity of the Project to the 10 mAHD contour. As can be seen, the site straddles the low to extremely low ASS categories, and is located beyond the 20 m contour.

Further soil investigation works to identify soil and geology of the Project area, and areas that could potentially be at risk of disturbing ASS will be undertaken as part of the EIS.



FAULTS
- Fault Approximate
- Fault Concealed
- Fault Inferred
- Trend Line
- Trend Line Showing Dip 5 to 15 Degrees

QUATERNARY
- Qa-QLD (Qa)
- Qf-QLD (Qf)
- Qr-QLD,Qf-QLD>Styx Coal Measures (Qr,Qf>Kx)

PLEISTOCENE
- Qpa-QLD (Qpa)

HOLOCENE
- Qhe/s-YARROL/SCAG (Qhe/s)

LATE TERTIARY-QUATERNARY
- TQr-QLD>Td-QLD (TQr>Td)
- TQr-QLD (TQr)

TERTIARY
- Ta-YARROL/SCAG (Ta)
- Td-QLD (Td)

EARLY CRETACEOUS
- Styx Coal Measures (Kx)

LATE PERMIAN
- Back Creek Group-Pb (Pb)
- Back Creek Group/s (Pb/s)
- Back Creek Group/s? (Pb/s?)
- Boomer Formation (Pbm)
- Boomer Formation? (Pbm?)

N

0 1 2 km

Scale @ A4 1:100,000
Date: 14/12/16
Drawn: Gayle B.

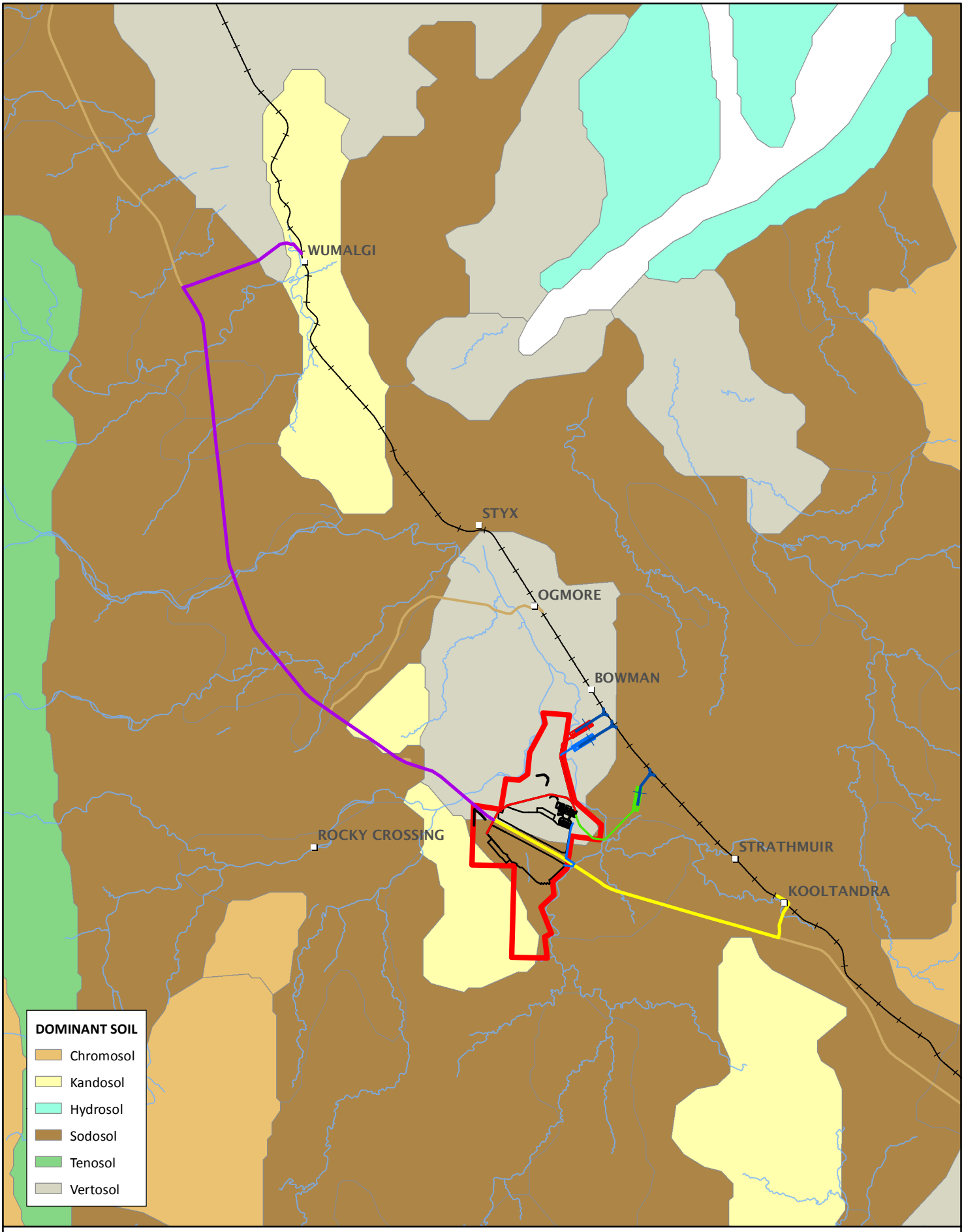
Legend
- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options
- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

Figure 4-2
Detailed surface geology

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith



Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

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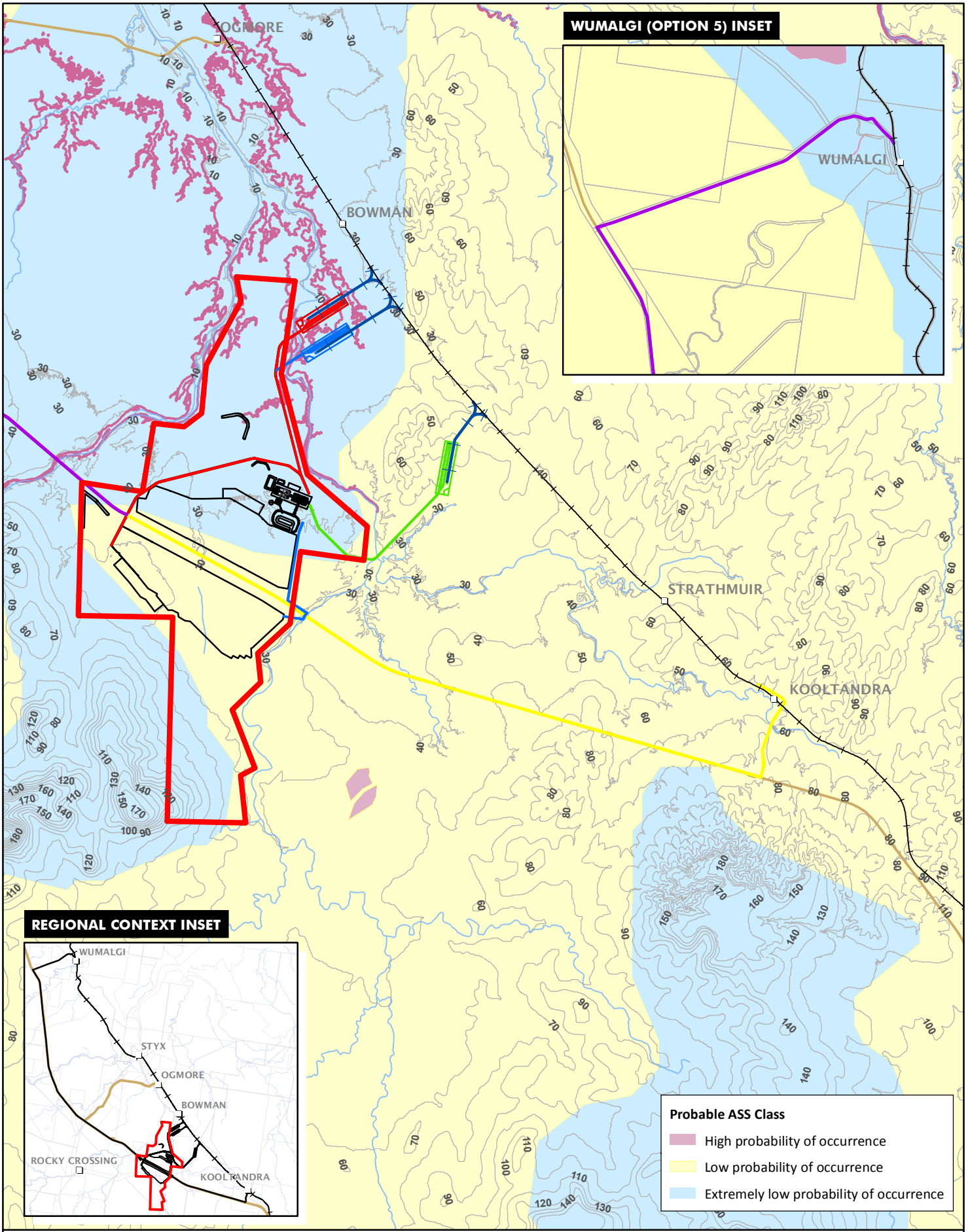
Scale @ A4 1:200,000
Date: 14/12/16
Drawn: Gayle B.

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016
(ASRIS) Australian Soil Resource Information System, (2016)

Figure 4-3
Dominant soils

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\BES150160.01 R1 soils.mxd 12/14/2016



Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- 20m contour
- 10m contour
- North Coast Rail Line
- Main road
- Watercourse

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

N

0 1 2 km

Scale @ A4 1:90,000
Date: 14/12/16
Drawn: Gayle B.

Figure 4-4
Acid sulfate soils

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

4.2.3.3 Land Use and Suitability

Approximately 80% of the MLA area has been historically cleared and converted to pasture (Oberonia, 2011). Water can pond in the landscape for a period of weeks to months after rainfall. The clay mineralogy of Vertosols produces shrink and swell characteristics that cause soil bulk density and hydraulic conductivity to vary with soil water content. The shrink-swell characteristics of some of the cracking clay soils (Vertosols) form melon holes (gilgai microrelief). Melon hole microrelief persists in spite of recurrent clearing of brigalow regrowth and disturbance of the cracking clay soil and varies significantly in diameter and depth.

The MLA and broader Project area has been used for beef cattle grazing for many years. There is no evidence from annual inspection of Landsat TM imagery of historical cropping activity within the Project boundary since 1999.

4.2.3.4 Potential Impacts

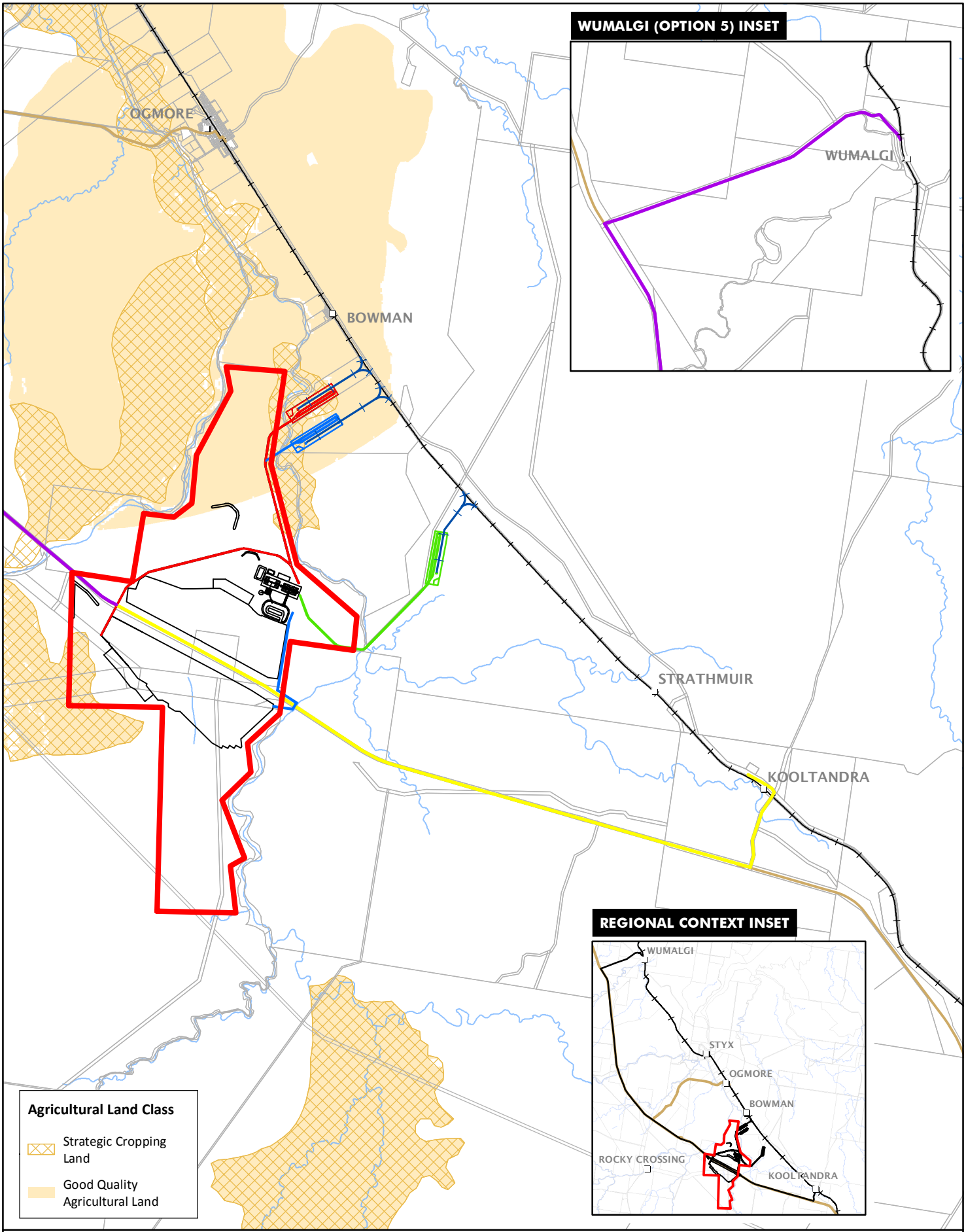
Mining may alter soil depth, stability and capacity of soils to recycle carbon and nutrients and the size of the seed bank. These factors can impact on the quality of the revegetation and the productivity of rehabilitated ecosystems affecting the post-mine use and visual amenity of the site. Exposure of weatherable minerals at the land surface may also result in exposure of dispersive, saline or reactive material that could reduce productivity and water quality, both on and off-site.

Good Quality Agricultural Land (GQAL) and Strategic Cropping Land (SCL) trigger areas occur over TLF Options 1 and 2 and part of the haul road to both TLF options. GQAL without a SCL overlay also occurs in a further section of the haul road to the TLF (see Figure 4-5). For the SCL aerial photograph assessment has not identified any evidence of cropping in the mapped SCL land since at least the late 1990s. Further ground assessment will be undertaken as part of the EIS to determine if the lands meet the SCL criteria and whether the lands would be subject to the SCL legislation, as well as identifying GQAL and land suitability.

4.2.4 Contaminated Land

The proposed MLA area incorporates land primarily used for cattle grazing on natural vegetation. Potentially contaminating activities, typical of agricultural related practices, that may occur inside the MLA area include:

- Chemical storage and use – herbicides, pesticides and fertilisers;
- Under and above ground fuel storage, in particular small (<10,000 L) tanks on homestead / farm holdings;
- Small mining enterprises, including several abandoned coal collieries along the rail line at Ogmore;
- Abattoirs (although no evidence, anecdotal or otherwise, was found for the area);
- Cattle burial sites (if any) – e.g. from deaths due to natural disasters, disease, etc.;
- Unlicensed landfill sites;
- Livestock dip or spray race operations (existing or abandoned);
- Sewage treatment – likely to consist of multiple small septic type systems scattered across the MLA area; and
- Dwellings constructed of fibrous cement and other material containing asbestos.



Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

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0 1 2 km

Scale @ A4 1:90,000
Date: 14/12/16
Drawn: Gayle B.

Figure 4-5
Agricultural land class designations

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016
QLD Web-based Agricultural Land Information (WALI), 2016

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\BES150160.01 R2 gd qual ag land & strategic crop land.mxd 12/14/2016

4.2.4.1 Historical Review

A search of the Environmental Management Register (EMR) and Contaminated Land Register (CLR) was undertaken on the 21 June 2011 for land on and adjoining the Project area subject to geological drilling activities over the Southern Resource, comprising the following allotments:

- Lot 9 on MC496;
- Lot 11 on MC23;
- Lot 10 on MC493;
- Lot 87 on SP164785;
- Lot 1 on RP616700; and
- Lot 85 on SP164785.

None of the lots within the Project area were listed on either the EMR or CLR register.

Field observations and review of aerial photography did indicate the presence of cattle yards, and one cattle dip was located on the Mamelon property, near the south-east corner of the proposed Main mine pit. No other obvious polluting activities or signs of contamination were evident. Further investigations will be undertaken as part of the EIS.

4.2.4.2 Potential Impacts

There is the potential for contamination of land during construction and operation of the Project due to accidental spillage of hazardous materials or inadequate management of mining activities. There is also potential for contamination to be present as a result of the former cattle dip site that is located on the Mamelon property.

4.2.5 Acid Mine Drainage

Coal is often formed in environments with a high potential to produce sulfides. Mining of the coal and removal of interburden and overburden can result in the oxidation of these sulfides generating acidic runoff (sulfuric acid) with elevated metal and sulfide concentration. In addition, mining, stockpiling and processing of material can result in leachate from stockpiles of materials with saline or high metal concentrations. As such, a geochemical assessment has been undertaken, primarily to determine the acid mine and metalliferous drainage properties of coal, coal rejects and waste rock (overburden/interburden) material.

The coal reject is the waste rock and coal that are not suitable for product sale, with coarse reject the course fraction and fine reject (or tailings) the fine fraction. Both coarse reject and tailings will be segregated from the coal product at the CHPP.

The coarse rejects generated from the CHPP will be dewatered and discharged onto the CHPP rejects conveyor, which reports to the rejects bin. During the first years of mining, the coarse rejects will be truck hauled and placed within the out-of-pit waste rock emplacement area. Once the mine is sufficiently established until the end of mine life, the coarse reject material will be placed in the in-pit voids between the waste rock piles in the pits. Truck-shovel waste rock materials including topsoil will be used to cover the coarse reject material as part of the rehabilitation strategy.

Waste rock comprises the overburden and interburden materials required to be mined to access underlying coal resources. Waste rock will be stored predominantly within the open pit, although an out of-pit waste rock emplacement area will be constructed adjacent to the main open pit using a truck-shovel operation to accommodate material from the initial box-cut developed during the first years of mining. Tailings will be co-disposed with coarse rejects (cost benefit and mass balance calculations are being undertaken as part of the project feasibility analysis).

Whilst raw coal will be stockpiled on-site for a relatively short period of time (compared to mining wastes) and will be removed from site for sale, this material is included in the geochemical assessment program to ensure that the quality of surface runoff and seepage does not have the potential to compromise surface water and groundwater resources at the site.

A geochemical assessment has been completed on representative samples of drill core from the north and south pit areas, with a total of 136 samples of waste rock materials and 27 samples of coal and potential coal reject materials from 14 drill holes. The results from this assessment indicate that:

- The risk of acid generation from coal and mining waste materials is low. The samples show that coal and mining waste materials typically have very low sulfur content. Given that most materials have a moderate to high acid neutralising capacity (ANC), the resultant Net Acid Producing Potential is typically strongly negative;
- The overwhelming majority (over 98 %) of coal and coal mining waste materials tested are classified as Non-Acid Forming (NAF). Whilst some material may occur with uncertain or Potentially Acid Forming (PAF) characteristics, PAF materials appear to be visually distinguishable in the field (through the rare occurrence of pyrite) and management by selective handling and encapsulation is likely to be relatively straightforward; and
- Initial surface runoff and seepage from coal, coarse reject and tailing materials is likely to be alkaline and have medium salinity value as defined under Queensland technical guidelines (DME, 1995).

4.2.5.1 Potential Impacts

Environmental harm could potentially occur in and around the Project site if wastes are not managed properly according to the planned management strategies. Sensitive receptors, including residences and ecosystems surrounding the Project site, could be impacted if AMD from coal and mining wastes or other waste streams entered waterways and groundwater systems and migrated off-site.

4.2.6 Visual Amenity

4.2.6.1 Existing Landscape Features

The area is characterised by a flat to undulating landscape with extensive cleared areas dominated by agricultural land uses with scattered natural elements including remnant grassland and open forest.

Tooloombah Creek Conservation Park is located approximately 2 km to the west of the site. Deep Creek and Tooloombah Creek are prominent riparian features within the site. The Styx River is also located downstream of the Project site.

The Great Barrier Reef (GBR) Marine Park commences at the mouth of the Styx River and the GBR World Heritage Area extends upstream of the Styx River to approximately 10 km north of the site. The Broad Sound wetlands are also located approximately 10 km north of the site. However, there are no sensitive or rare landscape features in close proximity to the site.

4.2.6.2 Visual Receptors

The nearest residential township is Ogmore, located approximately 4 km to the north of the site. Several rural properties are located to the south of Ogmore, in close proximity to the site. The site is dissected by the Bruce Highway, which is elevated above surrounding lands. It is expected that these nearby visual receptors will experience changes in visual amenity to varying degrees due to the Project.

The site is also surrounded by elevated areas to the west and east and distant views can be gained to the site from these locations. The degree of visibility of the Project site was assessed to determine the level of visual impacts on both nearby and distant visual receptors.

Currently, the site is not visible from the townships of Marlborough or St Lawrence due to the location of ranges between these townships and the site, which provide a topographical barrier. However, areas to the east of St Lawrence have partial views of the site. The site is partially visible from the township of Ogmore and surrounding rural properties. There are also partial views from the Bruce Highway; however, this will be reduced as the Project develops as waste material and native tree plantings will be used to screen the operations from the Bruce Highway.

4.2.6.3 Potential Impacts

Visual changes are likely to occur as a result of topographical changes associated with extraction of coal and installation of visually intrusive infrastructure within the site. The existing vegetation within the investigation area is relatively open and will provide minimal screening of mining infrastructure in visible locations of the site.

4.3 Surface Water

The MLA and broader Project area are located entirely within the Styx River catchment (Queensland river basin 127), a small catchment forming part of the Fitzroy River Natural Resource Management region, which discharges into the Coral Sea adjacent to Rosewood Island. The catchment is formed by the Connors and Broadsound Ranges to the west (Nogoa/Mackenzie system). The catchment is located within the Brigalow Belt bioregion, in the Central Queensland Coast region, and abuts the Broad Sound Fish Habitat Area, as well as the GBR Marine Park (refer to Section 4.5.2 for discussion on Environmentally Sensitive Areas). No water resource plan is in force over the catchment. The location of the Project in relation to the catchment and waterways is shown on Figure 4-6.

Environmental values of the broader area include high integrity estuarine and riparian habitat with relatively few anthropogenic influences. Apart from natural bank erosion associated with tidal movement and recent flooding, the only other disturbances are related to minor clearing of mangroves for boat access, vehicle access to parts of the saltmarsh and minor road and walkway construction associated with the Newport Conservation Area. The large tidal movement means that the Styx River estuary is well flushed. This will result in a short residence time of any eroded sediment and contaminants associated with the Project within this estuary. Receiving waters in the Styx River are already turbid, but runoff from the Project has the potential to further increase turbidity.

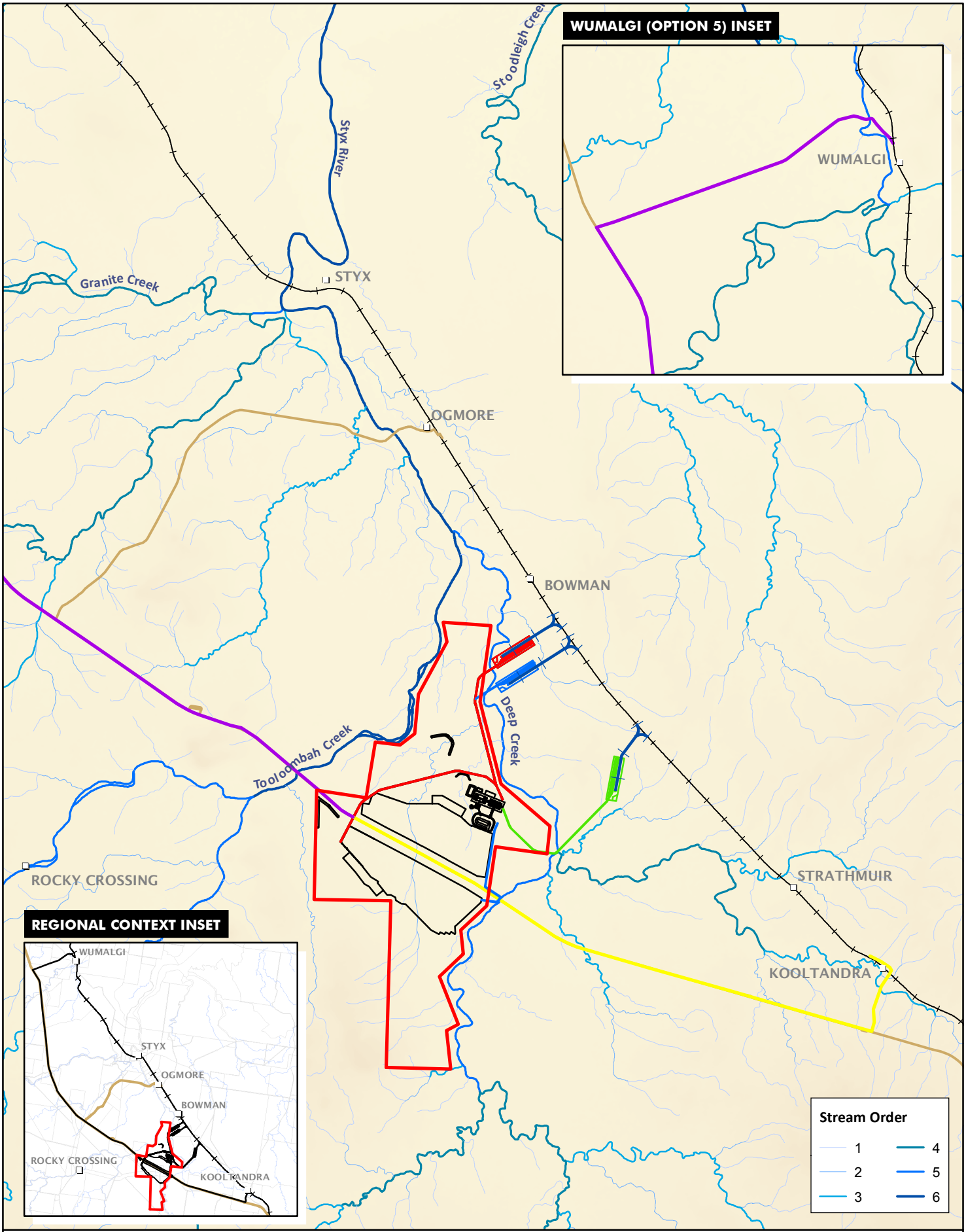
The mine infrastructure is located between two tributaries of the Styx River, namely Deep Creek and Tooloombah Creek. Each of the five TLF site options are located in the vicinity of mapped watercourses and most typically either stream order 2 or 3.

4.3.1.1 Flooding

The Styx catchment is expected to experience some form of flooding as approximately 5,000 ha of freehold and leasehold land and a small area of public land are at or below the high tide level (Melzer et al, 2008). Marine plains may be briefly inundated from heavy summer rainfall and floods of inflowing freshwater creeks, but, after the wet season, water persists only in ponds and channels with few areas remaining inundated by mid-late dry season. Previous flooding in the area has resulted in loss of communications, transport routes (including road, rail and air) and damage to crops (RRC, 2009). Floodplains have been modified within the catchment which may have altered the natural hydrology in the region (GBRMPA, 2007).

An initial assessment of flooding in the vicinity of the project area indicates that the mine infrastructure can be located above Q100 flood levels. However, part of the resource area is potentially impacted by the Q100 flood. Larger floods will exceed this level and could potentially impact on mining operations if suitable flood immunity measures are not implemented.

Detailed hydrologic and 2D hydraulic models are currently being developed to assess the potential flood impacts, and to develop mitigation measures for flooding.



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Scale @ A4 1:110,000
Date: 14/12/16
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Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Main road
- North Coast Rail Line
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

Figure 4-6
Project area watercourses

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

4.3.2 Potential Impacts

According to the *Environmental Protection (Water) Policy 2009,* the surface water environmental values that may potentially be impacted as a result of the Project include the:

- Biological integrity of the water course;
- Suitability of the water for agricultural uses;
- Suitability of the water for supply as drinking water;
- Suitability of the water for aesthetic or recreational use;
- Suitability of the water for industrial use; and
- Cultural and spiritual values.

The construction and operational components with most potential to impact on surface water quality and surface water flow regimes are presented in Table 4-3.

Table 4-3 Project components with the potential to impact surface waters

Construction components	Operational components
Mine pit	Pit excavation and dewatering
Building and infrastructure works	Processing, handling and transport of coal
Diversion of stream(s) around the pit areas	Management and storage of waste material, particularly coal rejects
Selective removal of riparian vegetation from streams	Ancillary activities, such as the operation of the CHPP, MIA (including workshops etc.)
In-stream works associated with road, rail and conveyor crossings	Water management systems, including flood immunity and site drainage structures
Movement of vehicles and the plant to and from and around the construction site	

The potential impacts to surface water resources from the above construction and operational components include:

- Erosion and sedimentation of waterways;
- Habitat loss;
- Surface water contamination;
- Increased surface water seepage;
- Coal dust emissions and spills during haulage;
- Riparian vegetation clearing and modification;
- Modification to in-stream habitat;
- Fish passage barriers;
- Runoff or chemical spills; and
- Alteration of stream and floodplain hydrology.

The aforementioned potential impacts will be further assessed in the EIS and appropriate mitigation measures will be proposed.

4.4 Groundwater

According to the Australian Natural Resources Atlas (ANRA, 2009), the Styx Basin is not covered by any Groundwater Management Unit (GMU), and the area is also characterised as Unmanaged-001 (i.e. not a managed unit) by the National Water Commission (2005). Limited data regarding groundwater resources are available, other than an estimate by CSIRO (2008) of a sustainable groundwater yield of 4 GL/year. However, this is likely to be a very approximate estimate given the scarcity and distribution of data.

The Styx catchment lies outside of any declared sub-artesian and mapped alluvial areas, and does not contain any groundwater monitoring network bores. A search of the DNRM groundwater database was undertaken to identify registered groundwater bores within 100 km of Ogmore. This search located approximately 1,200 bores, 112 of which are within the Styx catchment. Seventeen of the Styx catchment bores are located within the original EPC 1029. The bores relevant to the MLA area are shown at Figure 4-7.

4.4.1 Bore Census and Groundwater Levels

Coarse mapping of Australia at 1:5,000,000 by the Australian Geological Survey Organisation (1998) identified almost the entire Project area to be located within a region described as porous, extensive aquifers of low to moderate productivity. To the west, south and east are fractured or fissured, extensive aquifers of low to moderate productivity. These differentiations are broadly supported by bore records from the DNRM groundwater database.

The groundwater bore records included information on the depth of the aquifers encountered, and the standing water level measured after drilling. While limited data was available to provide a high level of certainty for most areas, the information does indicate that the water table / peizometric head is broadly a subdued reflection of the land surface (topography). Springs or artesian aquifers were not identified in the mapping or groundwater records for the Styx catchment.

The indicative groundwater flow is from south of the MLA area to north, towards the Styx River and into Broad Sound.

The aquifer location and standing water level from the well records were typically:

- Alluvial flood plains - 4 to 10 m depth to the top of the aquifer, with a groundwater head of 2 to 5 m below ground;
- Terraces and lower slopes – 8 to 20 m depth to the top of the aquifer, with a groundwater head of 4 to 20 m below ground; and
- Slopes and hills - 8 to 40 m to the top of the aquifer, with a groundwater head 2 to 15 m below ground.

Generally, groundwater bores within or close to the Project area were drilled in unconfined aquifers, on Quaternary alluvium (sand, mud and gravel commonly with 'melon holes' on higher terraces, and clay, silt, sand and gravel associated with floodplains) (Marlborough Geology, Sheet 8852, 1:100,000 DNRM&W, 2006). A bore located close to the investigation area on the Mamelon property (Bore RN97864) is drilled in the Cretaceous Styx Coal Measures. The borelog describes a sub-artesian fractured rock aquifer located approximately 40 m below ground surface and peizometric head 12 m below ground.

The information suggests that groundwater flow would be moderate to low in the vicinity of the Project area. Aquifer thicknesses were between 1 m and 6 m typically, with slightly thicker aquifers (up to 9 m thick) on terraces and lower slopes.

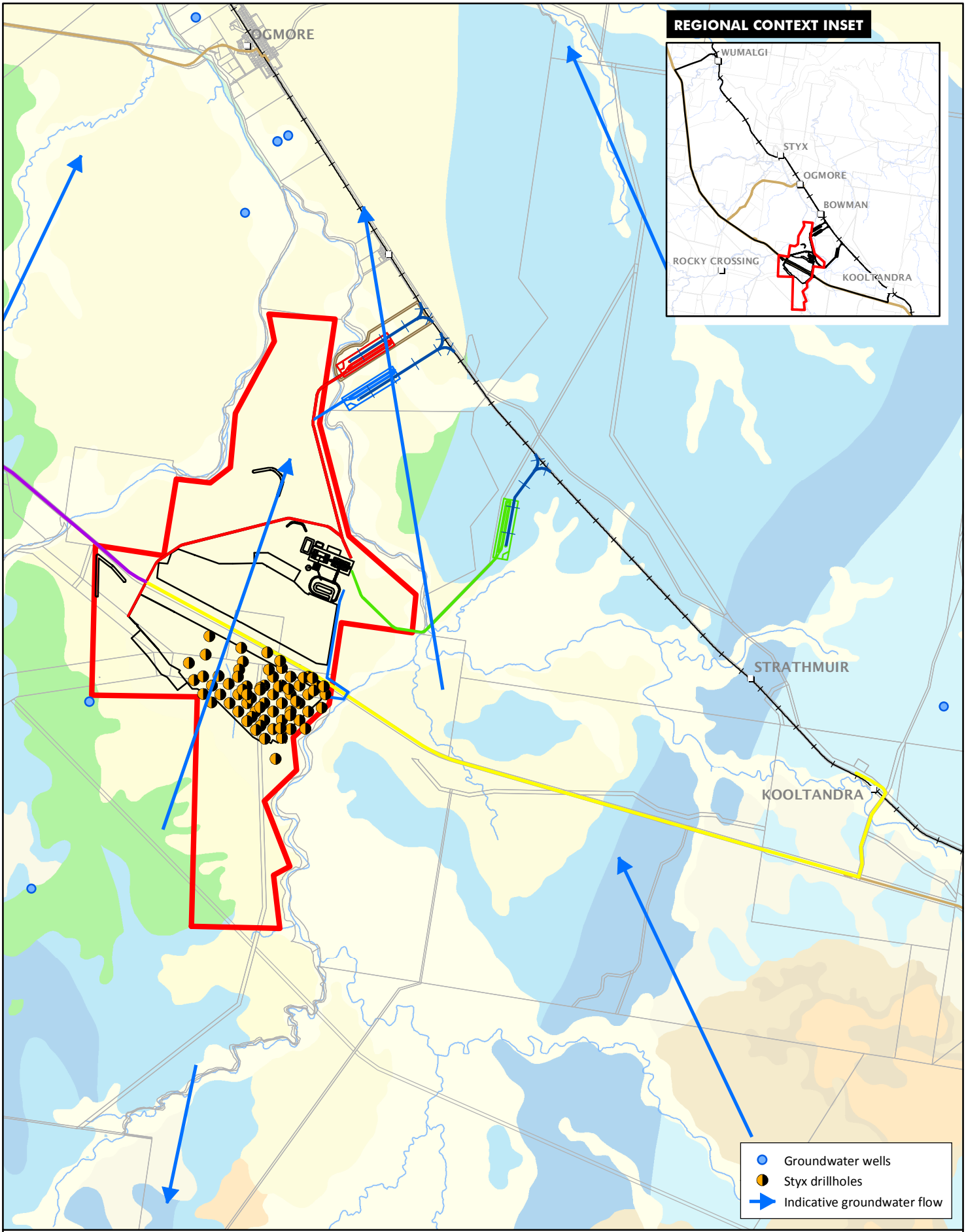


Figure 4-7
Bore census locations

Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- North Coast Rail Line
- Main road
- Watercourse

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

N

0 1 2 km

Scale @ A4 1:80,000
Date: 14/12/16
Drawn: Gayle B.

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

4.4.2 Groundwater Quality

Typically, the groundwater can be described as occasionally fresh but mostly brackish in alluvial aquifers, and brackish in fractured and weathered rock on hills and slopes. When considering groundwater for water supply, the results show relatively high total dissolved salts and chloride values, which would require desalination by reverse osmosis to produce potable quality water.

4.4.3 Groundwater Resource Use

Groundwater use throughout the Styx catchment is mainly for livestock watering, with some domestic usage.

The groundwater system provides baseflow to perennial streams in the lower elevated areas of the catchment. It is likely that some ecosystems in the lowlands of the catchment are reliant on groundwater resources, particularly during periods of prolonged drought. Further assessment of groundwater use and ecosystem reliance on groundwater within the Styx catchment is currently in progress.

4.4.4 Stygofauna

A baseline stygofauna survey has been conducted within the Project area in accordance with the Western Australian Environmental Protection Authority's Guidance Statement 54 - *Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986). Sampling of subterranean fauna in groundwater and caves*, and Guidance Statement 54a - the technical appendix (the WA Guidelines). In the absence of Queensland guidelines on subterranean fauna, at the time of assessment, the WA Guidelines were used.

The first round of sampling was conducted during the pre-wet season between 21 and 24 November 2011. A total of 27 groundwater bores were selected for stygofauna sampling. Two of the site surveyed registered one species at each site. Both species can be classed as stygofauna, including obligate groundwater species associated with the hypogean and permanent hyporheic environments.

The species composition of these sites indicates a fine to moderate grained unconsolidated alluvial aquifer with moderate to high connectivity with the associated river system with an interconnected hyporheic zone (Boulton and Hancock, 2006). The species also indicate moderate to high water quality and a shallow water table.

The absence of stygofauna from the remaining groundwater bores sampled for this Project does not indicate that they are not present in the aquifers sampled, rather, it may be due to unsuitable geological conditions (low porosity, low hydraulic conductivity), poor water quality (e.g. high EC or presence of other toxicants) or sampling from a recently drilled bore that has yet to stabilise and attract stygofauna (reduced likelihood of collection).

4.4.5 Potential Impacts

Open cut mining operations may locally impact on groundwater resources by the lowering of groundwater levels as a result of dewatering operations. Should the Project utilise groundwater resources for water supply, an impact in the form of lowered groundwater levels may occur in the alluvium associated with Tooloombah Creek and/or Deep Creek (depending on the draw location). Further investigations are being undertaken to assess the level of impact which may occur.

Contamination of groundwater resources is unlikely to eventuate from mining operations provided there is appropriate management of overland flows in the vicinity of disturbed areas. Water produced from open cut operations is likely to be brackish to moderately saline. Management of this water and its reuse in dust suppression and other mining activities, and ensuring that no offsite releases occur, will be key elements in minimising groundwater contamination from mining activities.

Mining operations that result in changes to groundwater quantity or quality may put stygofauna species at risk and this will be carefully considered when proposing management measures during the EIS process.

Direct effects on groundwater dependent ecosystems as a result of mining activities may include:

- Quantity (groundwater levels, pressures and fluxes);
- Quality (concentrations of salts and other toxic water quality constituents);
- Groundwater interactions (interactions between groundwater systems and between groundwater and surface systems); and
- Physical disruption of aquifers (excavation of mining pits and underground workings).

The extent of water affecting activities and their potential impact on groundwater resources will depend largely on the scale of the mining operation, mining method, and process water requirements, as well as the climatic and geological setting.

4.5 Nature Conservation

4.5.1 Bioregion and Subregion

The Project area occurs within the Brigalow Belt bioregion. Dominant vegetation communities include open forests (dominated by Brigalow(*Acacia harpophylla)*, Black Gidyea (*A. argyrodendron)*, Gidgee (*A. cambagei)*, Lancewood (*A. shirleyi)*, Dawson River Blackbutt (*Eucalyptus cambageana)*, River Red Gum (*E. camaldulensis)*, Forest Red Gum (*E. tereticornis)*), woodlands (dominated by Silver-leaved Ironbark (*Eucalyptus melanophloia*), Narrow-leaved Ironbark (*E. crebra*), Poplar Box (*E. populnea*), Brown's Box (*E. brownie*), *E. persistens*, Mountain Coolibah (*E. orgadophila*), Coolibah (*E. coolabah*), River Red Gum and Forest Red Gum) and small patches of semi-evergreen vine thicket.

The majority of the Project area occurs in the Marlborough Plains subregion (BRB14) of the Brigalow Belt bioregion.

The Marlborough Plains subregion is a characteristically undulating to hilly subregion with a complex geology.

The subregion is dominated by alluvial plains and colluvial slopes, usually supporting woodlands characterised by Poplar Gum (*Eucalyptus platyphylla*), Ghost Gum (*Corymbia dallachiana*), Forest Red Gum and Tea-tree (*Melaleuca* spp.) with low rises supporting Narrow-Leaved Ironbark.

4.5.2 Environmentally Sensitive Areas

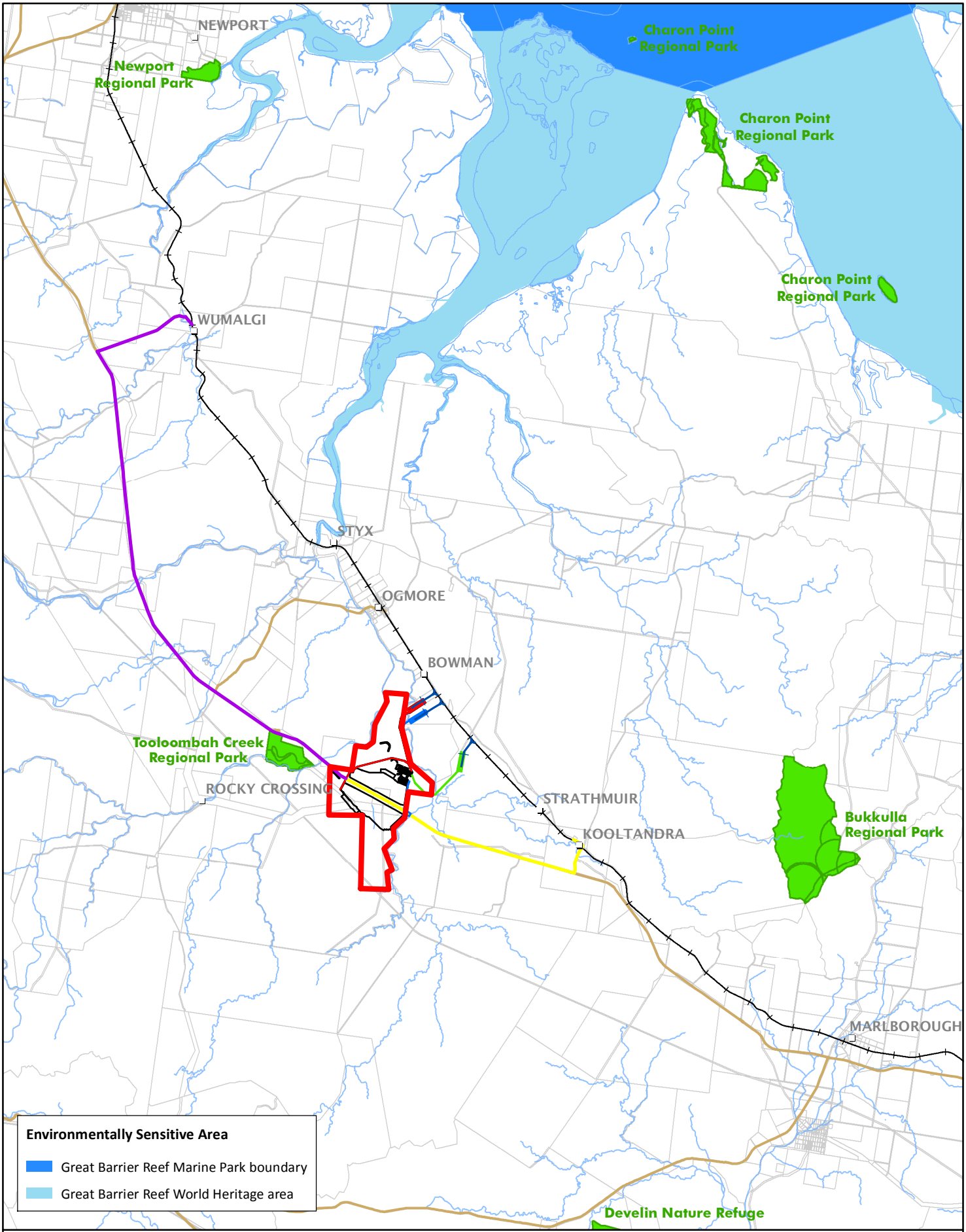
The Styx catchment contains a number of Environmentally Sensitive Areas (ESAs) including areas in the following ESA categories:

- Category A: Conservation Parks, Forest Reserves, Great Barrier Reef Marine Park Region;
- Category B: Fish Habitat Area, Marine Plants, Endangered Regional Ecosystems (Biodiversity Status); and
- Category C: Nature Refuges, State Forests, Coastal Management District.

Category A, B and C ESAs located within the broader Project area are shown at Figure 4-8, Figure 4-9 and Figure 4-10.

ESAs associated with the Project and adjacent areas include:

- Category A: Conservation Parks – Tooloombah Creek Regional Park;
- Category B –Endangered Regional Ecosystems (Biodiversity Status); and
- Category C – Coastal Management District.



Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

N

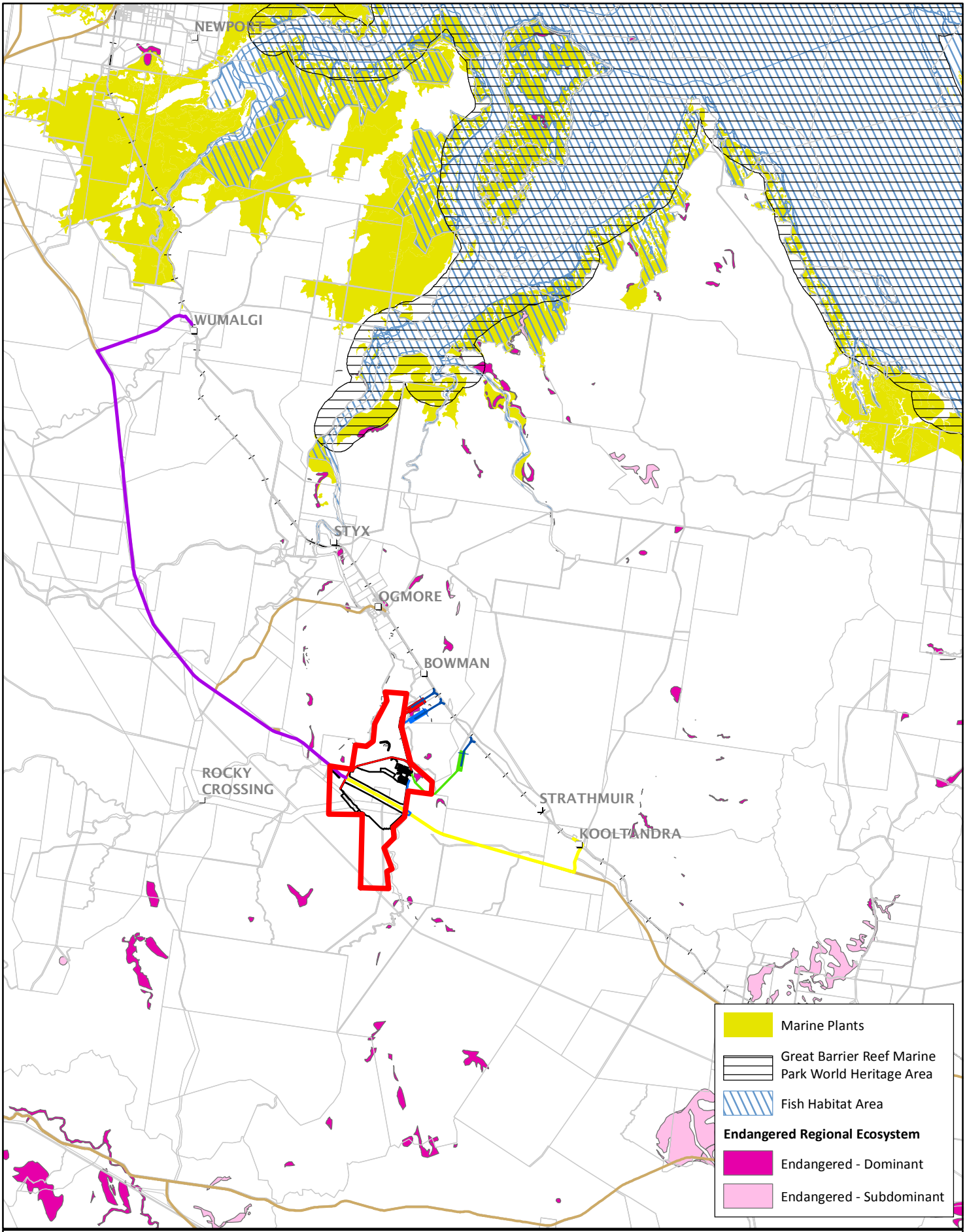
0 2.5 5 km

Scale @ A4 1:250,000
Date: 14/12/16
Drawn: Gayle B.

Figure 4-8
Environmentally Sensitive Areas - Category A

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith



Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- Main road
- North Coast Rail Line
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

N

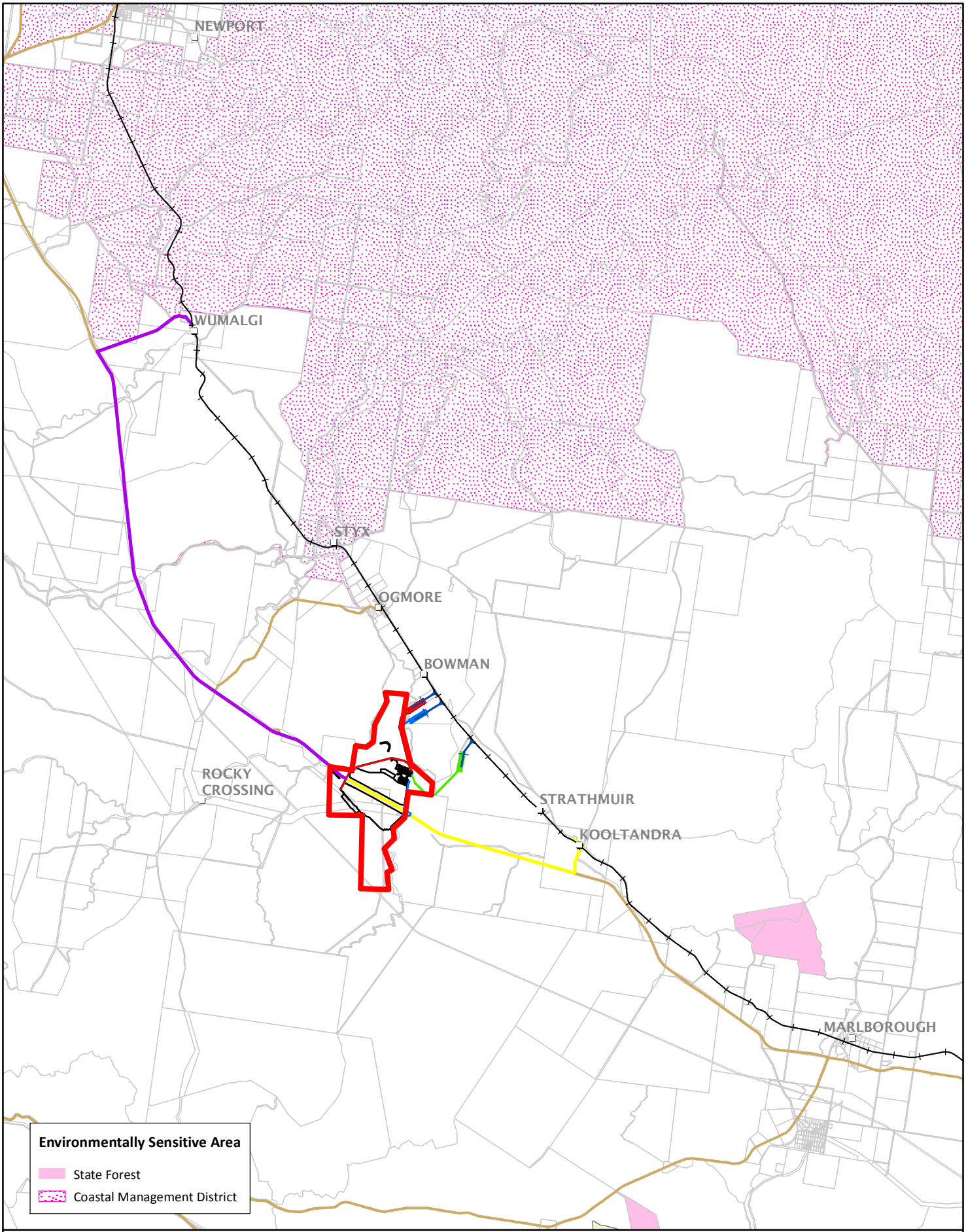
0 2.5 5 km

Scale @ A4 1:250,000
Date: 14/12/16
Drawn: Gayle B.

Figure 4-9
Environmentally Sensitive Areas - Category B

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith



Legend

- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- Main road
- North Coast Rail Line
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

N

0 2.5 5 km

Scale @ A4 1:250,000
Date: 14/12/16
Drawn: Gayle B.

Figure 4-10
Environmentally Sensitive Areas - Category C

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

4.5.3 Regional Ecosystems

Assessment of current DNRM RE mapping identified 12 REs occurring on six land zones within the Project area: alluvial river and creek flats (land zone 3); Cainozoic clay plains (land zone 4); Cainozoic sand plains (land zone 5); Cainozoic lateritic duricrust (land zone 7); coarse-grained sedimentary rocks (land zone 10) and (land zone 11) (Neldner et al. 2014). Of the mapped REs, one has been classed as Endangered, four have been classed as Of Concern and the remainder are classed as Least Concern under the provisions of the VM Act.

The Project area incorporates land holdings currently used for cattle grazing. Due to historical and current farming practice, native vegetation has been substantially cleared with approximately 1,812 ha of the 2,276 ha MLA area mapped as non-remnant. This equates to approximately 70% of the MLA area being mapped as non-remnant. All REs mapped as occurring within and adjacent to the MLA area and TLF options are listed at Table 4-4 and presented in Figure 4-11.

Table 4-4 Regional Ecosystem descriptions

RE	VM Act status	EP Act status	Description*
Within MLA area disturbance footprint			
11.3.25	Least Concern	Of Concern	*E. camaldulensis* or *E. tereticornis* open forest to woodland. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays.
11.4.2	Of Concern	Of Concern	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains
Within MLA area but outside of the disturbance footprint			
11.4.2	Of Concern	Of Concern	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.5.8a	Least Concern	No Concern	*Melaleuca* spp., *Eucalyptus crebra*, *Corymbia intermedia* woodland on Cainozoic sand plains/remnant surfaces
11.7.2	Least Concern	No Concern	*Acacia* species woodland on Cainozoic lateritic duricrust.
11.10.1	Least concern	No Concern	Corymbia citriodora woodland on coarse-grained sedimentary rocks
11.10.7	Least concern	No Concern	Eucalyptus crebra woodland on coarse-grained sedimentary rocks
11.11.15a	Least Concern	No Concern	*Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics
TLF Option 1			
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains
TLF Option 2			
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains
TLF Option 3			
11.3.25	Least Concern	Of Concern	*E. camaldulensis* or *E. tereticornis* open forest to woodland. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays.
TLF Option 4			
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.11.10a	Of Concern	Of Concern	*Eucalyptus moluccana* woodland. *Eucalyptus moluccana, E. tereticornis* may be prominent components of the tree layer, particularly on lower slopes.

RE	VM Act status	EP Act status	Description*
11.11.15a	Least Concern	No Concern	*Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics
11.3.36	Of Concern	Of Concern	*Eucalyptus crebra and/or E. populnea and/or E. melanophloia* on alluvial plains. Higher terraces
TLF Option 5			
11.3.25	Least Concern	Of Concern	*E. camaldulensis* or *E. tereticornis* open forest to woodland. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays.
Adjacent to MLA area boundary or TLF Options			
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	Least Concern	Of Concern	*E. camaldulensis* or *E. tereticornis* open forest to woodland. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays.
11.4.2	Of Concern	Of Concern	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains
11.10.1	Least concern	No Concern	Corymbia citriodora woodland on coarse-grained sedimentary rocks
11.10.7	Least concern	No Concern	Eucalyptus crebra woodland on coarse-grained sedimentary rocks
11.11.1	Least concern	No concern at present	Sporobolus virginicus grassland on marine clay plains
11.11.15a	Least Concern	No Concern	*Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics

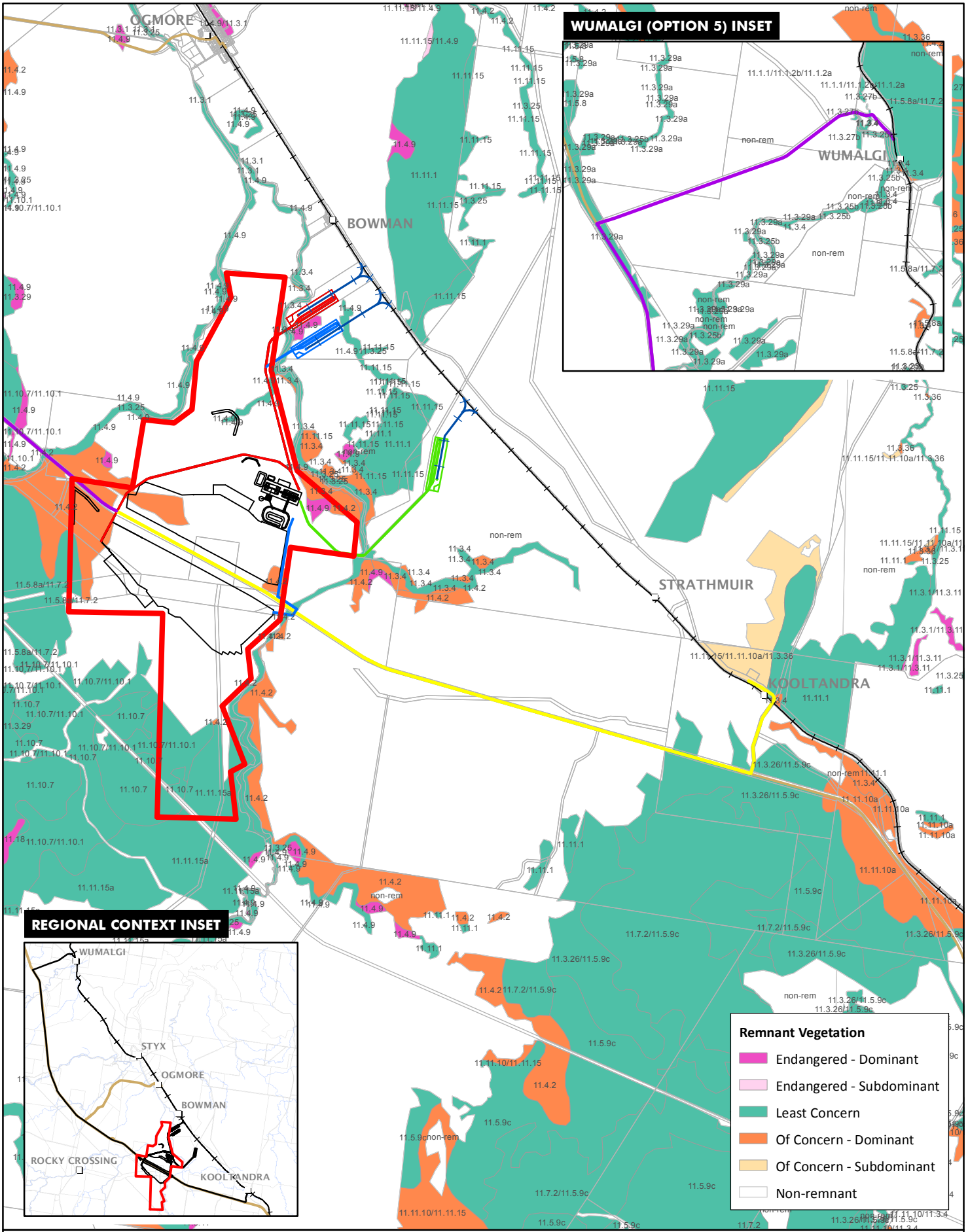
*(Source – Queensland Herbarium 2015)

Mining activities are exempt from requiring a permit to clear remnant vegetation under the VM Act. However, all REs occurring in the proposed mine disturbance area have a Biodiversity Status as Of Concern and may trigger requirements for vegetation offsets under the Queensland Environmental Offset Policy (Version 1.2) July 2016 and the EO Act.

An initial vegetation survey was carried out across a wide area surrounding the current Project site in March 2011 (YCE, 2011). Although the majority of survey sites were located outside of Project area, a number of sites lie within the current Project area.

Vegetation communities surveyed within the Project area included eucalypt woodlands, brigalow woodland, patches of regrowth and cleared sites associated with pastoral land use. Detailed description of the vegetation communities present within the MLA and adjacent areas are provided below. The vegetation communities delineated on site are broadly consistent with the mapped REs; however, these will be further verified through additional field assessment.

***Melaleuca leucadendra* and/or *Eucalyptus tereticornis* fringing open forest.** This vegetation community occurs along active riparian areas throughout the Project area. The canopy tended to be between 15 and 20 m and characterised by Melaleuca leucadendra and/or Forest Red Gum. Other taxa that may occur in the canopy include Carbeen (*Corymbia tessellaris*) and Northern Swamp Mahogany (*Lophostemon grandifloras*). An understorey is often present and may be characterised by Weeping Bottlebrush (*Melaleuca viminalis*), River Sheoak (*Casuarina cunninghamiana*), Red Ash (*Alphitonia excelsa*), Cocky Apple (*Planchonia careya*), White Cedar (*Melia azedarach*) or Sally Wattle (*Acacia salicina*). A variable shrub layer may be present at some sites and consist of Currant Bush (*Carissa ovata*), Coffee Bush (*Breynia oblongifolia*), Quinine Berry (*Petalostigma pubescens*) or *Indigofera* spp. The exotic species Lantana (*Lantana camara*) and Stylo (*Stylosanthes scabra*) may invade this community at some sites.



Legend

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- TLF / Haul Road Option 5

N

0 1 2 km

Scale @ A4 1:90,000
Date: 14/12/16
Drawn: Gayle B.

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

Figure 4-11
Remnant vegetation

CDM Smith

The ground layer tends to be open to sparse and consists of Spiny-head Matrush (*Lomandra longifolia*), Kangaroo Grass (*Themeda triandra*), Golden-Beard Grass (*Chrysopogon fallax*), Spreading Nutheads (*Epaltes australis*) or Queensland Bluegrass (*Dichanthium sericeum*). The ground layer is prone to invasion by exotic species such as Guinea Grass (*Megathyrsus maximus*), Snake Weed (*Stachytarpheta jamaicensis*), or Paspalum (*Paspalum dilatatum*). The species composition, land form and soil type correspond with the description of RE 11.3.25 (Least Concern).

Crebra woodland on alluvial plains. This vegetation community is associated with alluvial plains and is characterised by Forest Red Gum with Carbeen to 22 m. Narrow-leaved Ironbark can sometimes be present. An understorey is often present and comprised of Swamp Mahogany (*Lophostemon suaveolens*), Pegunny (*Lysiphyllum hookeri*) and Red Ash. Black Tea Tree (*Melaleuca bracteata*), Weeping Bottlebrush and/or *Melaleuca trichostachya* may be present in associated drainage lines or ponded areas.

A sparse shrub layer may be present with taxa such as Coffee Bush, Currant B or Booneree (*Alectryon diversifolius*). The ground layer tends to be dense and dominated by grasses such as *Bothriochloa* spp., Kangaroo Grass (*Themeda triandra*) and Black Spear Grass (*Heteropogon contortus*). The species composition, land form and soil type correspond with the description of RE 11.3.4 (Of Concern).

Brigalow shrubby woodland. This vegetation community is commonly associated with clay plains and areas of alluvium throughout the Project area. The ecologically dominant layer tends to be dominated by Brigalow with Belah at some sites. Emergent Gum-topped Box (*Eucalyptus moluccana*) or Forest Red Gum may occasionally be present. A low tree or tall shrub layer may be present and characterised by Red Ash, Yellow-wood (*Terminalia oblongata*), Yellow-berry Bush (*Maytenus cunninghamii*), Currant Bush, Boonaree and Wilga (*Geijera parviflora*).

The ground layer tends to be dominated by grasses with exotic grasses becoming more prevalent with increased grazing. Where this community occurs on alluvial soils, it corresponds with the description of RE 11.3.1 (Endangered). Where it occurs on clay plains it corresponds with the description of RE 11.4.9 (Endangered).

Mixed eucalypt woodland on clay plains. This dry sclerophyll vegetation community is associated with clay plains in the Project area. The canopy is characterised by co-dominance of a range of eucalypt species, including Narrow-leaved Ironbark, Poplar Box, Gum-topped Box, Queensland peppermint, Poplar Gum (*E. platyphylla*), Dawson Gum, Pink Bloodwood (*Corymbia intermedia*) and Carbeen. The understorey varies from open to sparse and is characterised by Belah, Red Ash, Quinine Bush, Beefwood (*Grevillea striata*), Sally wattle, and/or Corkwood Wattle (*A. bidwillii*).

Shrub layer is variable and may include False Sandalwood (*Eremophila mitchellii*), Broadleaved Tea-tree (*Melaleuca viridiflora*), Whitewood (*Atalaya hemiglauca*), and/or Wilga. Ground layer tends to be dense and characterised by grasses such as Kangaroo Grass, Black spear grass, *Eragrostis* spp., and *Bothriochloa* spp. The species composition, land form and soil type correspond with the description of RE 11.4.2 (Of Concern).

***Corymbia intermedia* and/or *Eucalyptus crebra*, +/- *E. platyphylla*, +/- *E. exserta*, +/- *Melaleuca viridiflora* shrubby woodland.** This vegetation community is associated with areas mapped as colluvial and residual deposits. The ecologically dominant layer is characterised by Pink Bloodwood and/or Narrow-leaved Ironbark to 18 m tall. Other taxa which may be present in the canopy include Carbeen, Poplar Gum, Dallachy's Gum (*Corymbia dallachyana*), Queensland Peppermint or Dawson Gum. Broad-leaved Tea Tree may form distinct patches in the understorey in some situations.

Other species which may occur in the understorey include Rosewood (*Acacia rhodoxylon*), Red Ash, Quinine Bush and *Acacia* spp. A low shrub layer is often present and includes species such as Small-fruited Mock Olive (*Notelaea macrocarpa*), Queensland Hemp (*Sida hackettiana*) or *S. cordifolia*.

A grassy ground layer is present and is variable in cover depending on the shrub density. Species common in the ground layer include Black Speargrass, *Aristida* spp., *Bothriochloa* spp. and Kangaroo Grass. The species composition, land form and soil type correspond with the description of RE 11.5.8 (Least Concern).

Eucalyptus crebra* and/or *Eucalyptus melanophloia* woodland with *Acacia rhodoxylon. This vegetation community is associated with areas of old sedimentary rock within the Project area. The ecologically dominant layer is characterised by Narrow-leaved Ironbark and/or Silver-leaved Ironbark (*E. melanophloia*) over a well-developed understorey of Rosewood. A shrub layer is often present and may include *Hibiscus divaricatus*, *Erythroxylon* sp., Yellow-berry Bush and Currant Bush. The ground layer is typically dense and characterised by various grass species. The species composition, land form and soil type correspond with the description of RE 11.11.1 (Least Concern).

***Eucalyptus crebra*, +/- *E. platyphylla*, +/- *E. populnea* grassy woodland.** The canopy of this vegetation community is characterised by Narrow–leaved Ironbark. Other species which also occur in the canopy include Poplar Box, Poplar Gum and Dallachy's gum. An open to spare understorey may be present and may include Red Ash and Beefwood among other species.

A shrub layer is often present and includes Yellow-berry Bush, Quinine Bush, Coffee Bush, Boonaree and *Hibiscus divaricatus*. Ground layer tends to be dense and characterised by various grass species including Black Speargrass, *Bothriochloa* spp., Kangaroo Grass and *Panicum* spp. The species composition, land form and soil type correspond with the description of RE 11.11.15 (Least Concern).

Wetland. A small wetland area occurs north of Mount Bison Road at the western extremity of the Project area. This wetland is a large closed depression approximately 200 m across. Margins of the wetland are broad and open with extensive area of shallow water (<30 cm deep) with deeper water (>30 cm deep) towards centre of the depression. Broadleaved Tea-tree, up to 8 m in height, occur in standing water with a variety of sedges at centre of the wetland. Sparse cover of hydrophytes (including *Ottelia ovalifolia*) present near centre of wetland as well. Dry margins of wetland with sparse to dense cover of low sedges and forbs (generally <20 cm in height). Surrounded by mixed eucalypt woodland with Poplar Gum, Carbeen and Variable-barked Bloodwood (*Corymbia erythrophloia*) co-dominant and a dense to mid-dense ground layer of grasses and forbs (mostly <50 cm).

Cleared areas. A large proportion (approximately 80%) of the MLA area has been heavily altered by grazing activities. Alteration has occurred through historical vegetation clearing associated with the pastoral industry. These areas typically support a mix of exotic and native perennial grass species and may have patches of regrowth.

4.5.4 Threatened Ecological Communities

The Protected Matters Search Tool identified five listed Threatened Ecological Communities (TECs) listed as Endangered (under the Commonwealth's EPBC act) as having potential to occur in the Project area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) – Endangered;
- Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland;
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin; and
- Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (north and south) and Nandewar Bioregions – Endangered.

Current DNRM vegetation mapping indicates there is one RE present within the Project area (RE 11.4.9) that may be considered as a Brigalow TEC. This RE is mapped as occurring in two discrete patches in the northern portion of the MLA area. No other TECs are represented by REs indicated in DNRM mapping. The presence of TEC associated REs will be further verified through additional field assessment.

4.5.5 Essential Habitat

EHP has mapped areas designated as essential habitat for species listed as Endangered, Vulnerable, or Near Threatened (EVNT) under the NC Act. There is no essential habitat identified as occurring on the proposed mine disturbance area.

4.5.6 Threatened Flora

Database searches identified a total of 24 conservation significant flora species listed as Endangered, Vulnerable or Near Threatened (EVNT) under the NC Act as potentially occurring in the Project area. Three of these species are also listed as Vulnerable under the EPBC Act and one species is also listed as Endangered under the EPBC Act. The WildNet database search identified 21 EVNT flora species recorded previously within a 50 km radius of the centre of the Project area. The Protected Matters Online Search Tool predicted the occurrence in the wider area of a further three conservation significant flora species listed under the EPBC Act. These species and their potential to occur within the Project area are discussed in detail in Table 4-5.

Initial field surveys have been conducted across the broader Project area with one conservation significant species, *Eleocharis blakeana* confirmed. This species is listed as Near Threatened under the NC Act. No EPBC Act listed threatened species were recorded from any of the sites assessed during the initial field surveys. The black orchid (*Cymbidium canaliculatum*) was identified as an epiphyte on older trees within the study area. This species is offered protection under the NC Act due to its commercial value. Further field assessments focussing on the disturbance areas will be undertaken as part of the EIS.

Table 4-5 Conservation status listed species that are known or are highly likely to occur

Species	Status		Habitat characteristics	Likelihood of occurrence^
	CTH	QLD		
Bursaria reevesii		V	Grows along drainage lines and creek beds in silty loams derived from ultramafic (serpentine) rocks (Cayzer et al., 1999).	**Unlikely**. Serpentine derived soils not represented in Project area.
Capparis thozetiana	V	V	Confined to serpentinite hills and adjacent undulating colluvial aprons. The species grows on mostly shallow skeletal serpentinitic soils in woodland communities dominated by *Eucalyptus fibrosa* and *Corymbia xanthope*.	**Unlikely**. Serpentine derived soils not represented in Project area.
Corymbia xanthope Glen Geddes bloodwood	V	V	Occurs in woodlands with *Eucalyptus fibrosa* on ridges or hill slopes on serpentinite geology with sandy soils in the Rockhampton area. The total extent of the population occurring from an area of about 20 km^2 between Rockhampton and Yeppoon).	**Unlikely**. This community is recognised as a distinct regional ecosystem (RE 11.11.7 *E. fibrosa* subsp. (Glen Geddes), *C. xanthope* woodland on serpentinite) which has not been recorded within the Project area
Cycas ophiolitica Marlborough Blue	E	E	Occurs from Marlborough in the north, to the Fitzroy River near Rockhampton in the south, in woodland or open woodland dominated by eucalypts, often on serpentinite substrates. Plants occur along hilly outcrops and in lower regions near creek systems.	**Unlikely**. Habitat for this species not represented in Project area.
Hakea trineura Three-veined Hakea	V	V	Occurs on serpentinite-derived soil, often with Broad-leaved Ironbark and *Corymbia xanthope* woodland over hummock grassland on hills.	**Unlikely**. Serpentine derived soils not represented in Project area.
Macrozamia serpentina		E	Occurs from Marlborough in the north, to the Fitzroy River near Rockhampton in the south, in woodland or open woodland dominated by eucalypts, often on serpentinite substrates. Plants occur along hilly outcrops and in lower regions near creek systems.	**Unlikely**. Habitat for this species not represented in Project area.
Marsdenia brevifolia	V	V	Occurs on serpentine rock outcrops or crumbly black soils derived from serpentine in eucalypt woodland, often with Broad-leaved Ironbark (*Eucalyptus fibrosa*) and *Corymbia xanthope*	**Unlikely**. Serpentine derived soils not represented in Project area.
Myrsine serpenticola		E	Known from gallery rainforest on serpentinic soils.	**Unlikely**. Rainforest habitat for this species not represented in Project area.
Neoroepera buxifolia	V	V	Known from two small areas between Marlborough and Yaamba, and between Rockhampton and Yeppoon, in Queensland. This species occurs along creek banks or in creek beds on serpentitite soils (Henderson, 1992; Batianoff et al., 2000) in riparian vine thicket, vine forest, melaleuca or eucalypt woodland or open forest with rainforest species in the understorey.	**Unlikely**. Serpentine derived soils not represented in Project area.
Olearia macdonnellensis	V	E	Occurs in eucalypt open forest in the Marlborough region of central Queensland, all records are from rocky serpentinite hills and ridges.	**Unlikely**. Habitat for this species not represented in Project area.

Species	Status		Habitat characteristics	Likelihood of occurrence^
	CTH	QLD		
Omphalea celata	V	V	Known from three sites in central east Queensland occurring in SEVT. Locations are Hazlewood Gorge, near Eungella; Gloucester Island, near Bowen; and Cooper Creek in the Homevale Station area, north-west of Nebo (TSSC, 2008)	**Unlikely**. Habitat for this species not represented in Project area.
Phaius australis Lesser Swamp-orchid	E	E	Commonly associated with coastal wet heath/sedgeland wetlands swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany (*Eucalyptus robusta*) is found (Sparshott and Bostock, 1993). It is restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest, swampy rainforest, or fringing open forest. It is often associated with rainforest elements or Cabbage Tree Palm (*Livistona australis*) (Benwell, 1994).	**Unlikely**. Habitat for this species not represented in Project area.
Pimelea leptospermoides	V	NT	occurs from near Marlborough to Rockhampton in Queensland on stony hillsides and sandy clay in Eucalyptus fibrosa and Corymbia xanthope open woodland and is widespread on serpentine soils (Batianoff et al., 2000)	**Unlikely**. Serpentine derived soils not represented in Project area.
Pultenaea setulosa	V	V	Occurs on serpentinite substrates in *Eucalyptus fibrosa* and/or *Corymbia xanthope* woodlands or open forests	**Unlikely**. Serpentine derived soils not represented in Project area.
Samadera bidwillii Quassia	V	V	Occurs in lowland rainforests or rainforest margins and occasionally open forests, woodlands and mangroves in lithosols, skeletal soils, loamy sands, sands, silts and sands with clay subsoils at 1 to 617m altitude in coastal regions (DNR 2000).	**Possible**. Habitat for this species represented in Project area; however, no individuals were recorded during field surveys.
Sannantha brachypoda		V	There is little information available on this species; however, it has been recorded at Apis Creek west of Marlborough although the majority of the records are to the south of the Capricorn Highway (i.e. Precipice and Humboldt National Parks). Records suggest SEVT and riparian corridors within Eucapypt woodlands as the preferred habitat.	Limited information available on habitat type for this species, however no specimens were detected during site surveys.
Solanum elachophyllum		E	Known only from limited collections in the Leichhardt pastoral district, occurring on cracking clay soils associated with Brigalow, Belah (*Casuarina cristata*), Macropteranthes or Dawson River Blackbutt.	**Possible**. Habitat for this species represented in Project area. Closest known population is 65 km west of the Project area.
Stackhousia tryonii		NT	Occurs on serpentinite soils in the Port Curtis area of central Queensland.	**Unlikely**. Serpentine derived soils not represented in Project area.

Notes:
EPBC Act –*Environment Protection and Biodiversity Conservation Act 1999* (Cth); E –Endangered; V – Vulnerable
NC Act –*Nature Conservation Act 1992* (QLD), E – Endangered; V – Vulnerable; N – Near Threatened; LC –Least Concern.
^Likelihood of occurrence: **known** = species recorded within the project area; **likely** = species identified by database searches as having geographical range overlapping the wider study area and suitable habitat is mapped within the project area; **possible** = species identified by database searches as having geographical range overlapping the wider study area and sub-optimal habitat or preferred habitat features are mapped within the project area; **unlikely** = species identified by database searches as having geographical range overlapping the wider study area and suitable habitat is not mapped within the proposed project area.

4.5.6.1 Potential Impacts

Remnant vegetation present within the mine disturbance area is currently disturbed by agricultural activities. Connectivity between remnant patches is greatly reduced due to extensive clearing for agriculture. Remnant riparian vegetation along watercourses currently provides connectivity across the landscape. Vegetation clearing will result in loss of remnant and regrowth vegetation within the mine disturbance area.

This may include an ecological community that is listed as Endangered under both the EPBC Act and the VM Act. In addition, regional ecosystems listed as Of Concern and Least Concern under the VM Act will be impacted within the mine disturbance area.

Approximately 55 ha of remnant vegetation will be impacted from within the proposed mine disturbance area. Vegetation communities to be impacted by clearing within the mine disturbance area are listed in Table 4-6.

Table 4-6 Vegetation communities to be cleared

RE	VM Act status	EP Act status	Description*	Potential Disturbance Area
11.3.25	Least Concern	Of Concern	*E. camaldulensis* or *E. tereticornis* open forest to woodland. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays.	<1 ha
11.4.2	Of Concern	Of Concern	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains	52 ha
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	<1 ha

The extent of vegetation clearing associated with the haul road and TLF development will be dependent on the selected TLF option. Of the five TLF options under consideration, only Option 1 will result in clearing (~2 ha) of Endangered REs (11.4.9). Option 4 TLF will potentially result in the clearance (~2 ha) of Of Concern RE (11.3.4 and 11.11.10a/11.3.36). Options 2, 3 and 5 will potentially result in the clearance of small areas of Least Concern REs.

Other potential impacts on terrestrial flora within the Project area may include establishment and spread of weed species and soil erosion and sedimentation.

4.5.7 Fauna

A desktop review was carried out on the Project area and surrounds using information from the relevant Commonwealth and State wildlife databases:

- Commonwealth EPBC Act Protected Matters Search Tool (DotEE) (to confirm potential presence of listed species) (20 km radius surrounding Project area); and
- EHP's WildNet (Wildlife Online) database and Species Profile Search results (20 km radius surrounding Project area).

A total of 144 species of terrestrial vertebrate are known or predicted to occur within a 20 km radius of the Project area, comprising 2 frogs, 12 reptiles, 114 birds and 16 mammal species.

Amongst the fauna previously recorded within or near the Project on the WildNet database are eight species of conservation significance.

This includes five threatened (EVNT) fauna species:

- Red Goshawk (*Erythrotriorchis radiatus*) - Vulnerable under the NC Act and Endangered under the EPBC Act;
- Squatter Pigeon (southern race) (*Geophaps scripta*) - Vulnerable under the EPBC Act and NC Act;
- Black-breasted Button-Quail (*Turnix melanogaster*) - Vulnerable under the EPBC Act and NC Act;
- Koala (*Phascolarctos cinereus*) - Vulnerable under the EPBC Act and NC Act; and
- Pale Imperial Hairstreak (*Jalmenus eubulus*) - Vulnerable under the NC act.

An additional two bird species listed as Migratory under the EPBC Act have been recorded from the wider Project area previously: Rufous Fantail (*Rhipidura rufifrons*) and Spectacled Monarch (*Symposiarchus trivirgatus*).

A single species listed only as Special Least Concern has also been recorded: Short-beaked Echidna (*Tachyglossus aculeatus*).

No Essential Habitat has been mapped for any listed fauna species in the vicinity of the Project.

The Protected Matters Online Search Tool has predicted the potential occurrence within the Project area of an additional 13 bird species, six mammal species, three reptiles and one sawfish species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act. The majority of these species are also listed as EVNT under the NC Act (refer Table 4-7). A further 13 bird species and a single reptile are listed as Migratory under the EPBC Act are also predicted to occur in the Project area. This assessment does not consider a number of marine and oceanic species listed under the EPBC Act which have been predicted to occur in the Protected Matters Online Search Tool. The Project area does not encompass habitat for these species.

The Project does not occur within or adjacent to any Ramsar sites, but is approximately 8 km from where the Styx River becomes Broad Sound, an internationally important area for migratory shorebirds including Red-necked Stint (*Calidris ruficollis*), Sharp-tailed Sandpiper (*Calidris acuminate*) and Marsh Sandpiper (*Tringa stagnatilis*). Broad Sound is also of national significance for the Great Knot (*Calidris tenuirostris*), supporting one of the largest aggregations of this species on Australia's east coast.

4.5.7.1 Field Surveys

Initial field-based investigations were conducted at various locations within and adjacent to Project area during March 2011, September 2012 and February 2012. There were 236 fauna species recorded during these surveys (Meyer, 2012).

This includes four species that are listed as EVNT under the NC Act or the EPBC Act including:

- Squatter Pigeon (southern race);
- Eastern Curlew (*Numenius madagascariensis*) - listed as vulnerable under the NC Act and Critically Endangered and Migratory under the EPBC Act;
- Ornamental Snake (*Denisonia maculata*) - listed as vulnerable under both the NC Act and EPBC Act; and
- Koala.

Of the EVNT species recorded, Squatter Pigeon was recorded within the Project area. Ornamental Snake was recorded approximately 4 km north of the Project area.

Six bird species listed as Migratory under the EPBC Act (also Special Least Concern under the NC Act) were also recorded during the 2011 and 2012 surveys, including:

- Glossy Ibis (*Plegaidis falcinellus*);
- Rufous Fantail;
- Whimbrel (*Numenius phaeopus*);
- Fork-tailed Swift (*Apus pacificus*);
- Caspian Tern (*Sterna caspia*);
- Oriental Cuckoo (*Cuculus saturatus*); and
- Rainbow Bee-eater (*Merops ornatus*).

The surveys also recorded Short-beaked Echidna (*Tachyglossus aculeatus*) which is listed as Special Least Concern under the NC Act.

Habitat information provided by the 2011 and 2012 fauna assessments indicated the wider area surrounding the Project may provide suitable habitat for the following conservation significant species: Yellow Chat (*Epthianura crocea*), Australian Painted Snipe (*Rostratula australis*), Yakka Skink (*Egernia rugosa*), Black-breasted Button-quail, Northern Quoll (*Dasyurus hallucatus*), Red Goshawk (*Erythrotriorchis radiatus*), Collared Delma (*Delma torquata*) and the Pale Imperial Hairstreak Butterfly (*Jalmenus eubulus*).

Table 4-7 Likelihood of occurrence of conservation significant and terrestrial migratory fauna

Species	Status*		Habitat preference	Likelihood of occurrence
	NC Act	EPBC Act		
Known				
Ornamental Snake (*Denisonia maculata*)	V	V	Occurs in low-lying areas with deep-cracking clay soils that are subject to seasonal flooding, and adjacent areas of clay and sandy loams. The species is found in woodlands and shrublands, such as Brigalow, and in riverine habitats, and lives in soil cracks and under fallen timber (Ehmann 1992; and Wilson 2015). Potential habitat is associated with REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9 and 11.5.16 or where they occurred before clearing. (DSEWPaC 2011).	**Known.** One individual was recorded during the 2011 survey within Brigalow woodland and adjacent to a cleared gilgai area. Potential habitat occurs within the Project area associated with Brigalow and Belah woodlands and gilgai areas.
Squatter Pigeon - southern subspecies (*Geophaps scripta scripta*)	V	V	Dry grassy eucalypt woodlands and open forests, also Callitris and Acacia woodlands. Most birds live in sandy sites near permanent water (Frith 1982; Blakers et al. 1984; and Crome and Shields 1992). Often around cattle yards and other disturbed areas.	**Known.** Several individuals were recorded within and adjacent to the Project area during the 2011 surveys and extensive habitat exists within the Project area associated with grassy woodlands.
Fork-tailed Swift (*Apus pacificus*)	S	M	An aerial non-breeding summer visitor, may occur over any habitat type, including cleared land and infrastructure.	**Known.** Wide ranging aerial species which migrates from the northern hemisphere to Australia. Less common than the previous species. May be aerial visitor to the Project area in the summer months as suitable foraging habitat occurs over much of the Project area. This species was recorded during the 2011 surveys.
Rufous Fantail (*Rhipidura rufifrons*)	S	M	Generally, occur in dense vegetation, mainly in rainforests, but also in wet sclerophyll forests and other dense vegetation such as mangroves, drier sclerophyll forests, woodlands, parks and gardens (Higgins et al. 2006).	**Known.** Recorded within during the 2011 surveys within the Brigalow woodland.
Short-beaked Echidna (*Tachyglossus aculeatus*)	S		Occurs throughout Australia in almost all terrestrial habitats except for intensively managed farms. It shelters in logs, crevices, burrows and leaf litter (Menkhorst and Knight 2004; Augee 2008).	**Known.** Observed from previous surveys and abundant suitable habitat occurs within the Project area.

Species	Status*		Habitat preference	Likelihood of occurrence
	NC Act	EPBC Act		
Glossy Ibis (*Plegadis falcinellus*)	S	M	Terrestrial wetlands, preferring inland freshwater wetlands with abundant aquatic flora (Pringle 1985; and Marchant and Higgins 1990).	**Known.** Dams in the Project area provide habitat for this species and species recorded during previous surveys.
Whimbrel (*Numenius phaeopus*)	S	M	Occurs on coastal mudflats, coral cays, estuaries, sewage ponds and sometimes flooded grasslands or paddocks (Pizzey and Knight 2007).	**Known.** Recorded from the wider Project area during previous fauna surveys.
Koala (*Phascolarctos cinereus*)	V	V	Feed almost entirely on eucalypts (Martin et al. 2008); most likely in riverine and riparian habitats.	**Known.** Recorded within the Project area during the 2011 and 2012 surveys. Suitable habitat exists within areas of remnant Eucalyptus woodlands within the Project area.
Likely				
Red Goshawk (*Erythrotriorchis radiatus*)	E	V	Endemic to northern and eastern Australia in coastal and subcoastal areas with large home ranges of up to 200 km^2. Occurs in woodlands and forests and prefers mosaic habitats that hold a large population of birds and permanent water. Riparian areas are heavily favoured (Marchant and Higgins 1993).	**Likely.** One Wildlife Online database record. The Project area and surrounds provides potential habitat and this species may utilise Project area for foraging and potentially nesting.
Grey-headed Flying-fox (*Petropus poliocephalus*)	C	V	Nomadic species that generally roosts at sites near water and within 50 km of the coast generally with rainforest, paperbark or casuarina species. Generally, occurs further south but regular roost site found near Finch Hatton (Eungella area) in recent years (Roberts et al. 2008).	**Likely.** No database records from the wider area. However, potential for the species to forage in the Project area during eucalypt flowering periods. Although there is no known roost habitat in or near the Project area, the site may provide some seasonal flowering resources for foraging.
Ghost Bat (*Macroderma gigas*)	V		One of the largest microbat species in the world. Roosts in shallow caves, abandoned mines and rock piles. Australia's only carnivorous bat (Churchill 2008).	**Likely.** No records from wider area but potential foraging habitat within the Project area.
Greater Glider (*PtauroidesvVolans*)	LC	V	May occur in a range of eucalypt dominated habitats from coastal areas to ranges. Needs large hollow-bearing trees for daytime roosting.	**Likely.** Habitat generally variable but some potential habitat available.

Species	Status*		Habitat preference	Likelihood of occurrence
	NC Act	EPBC Act		
Potential				
Yakka Skink (*Egernia rugosa*)	V	V	Occurs in dry forests, woodlands and rocky areas (Wilson 2015). Variety of drier forests and woodlands (usually on well drained, coarse gritty soils) including Poplar Box on alluvial soils, low ridges, Callitris on sands, Belah (Ehmann 1992; Cogger 2000; and Wilson 2015). Also occur in highly degraded sites and where there are log piles and rabbit warrens (EPA 2003).	**Potential.** Potentially suitable habitat in Project area associated with open forest and woodlands with suitable shelter and cover. No database records occur in the vicinity of the Project area.
Northern Quoll (*Dasyurus hallucatus*)	C	V	Formerly occurred in a variety of habitats across northern Australia and Queensland. Now most common in rocky eucalypt woodland and open forest within 200 km of the coast (Menkhorst and Knight 2004).	**Potential.** Potential denning, shelter and foraging habitat associated with woodland and open forest occurs in the wider Project area, particularly to the south and west. No database records from the wider area occur for this species.
Australian Painted Snipe (*Rostratula australis*)	V	E	Terrestrial shallow wetlands, ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, saltmarsh, dams, rice crops, sewage farms and bore drains (Marchant and Higgins 1993). Most likely in alluvial areas but could also occur in gilgaied areas.	**Potential.** May be occasional visitor to dams in the Project area but in general the habitats available are unsuitable. Very uncommon species that occurs erratically over eastern and northern Australia. No database records.
Caspian Tern (*Hydroprogne caspia*)	S	M	Mostly coastal habitats but also inland terrestrial wetlands including lakes, reservoirs and large rivers (Higgins and Davies 1996).	**Potential.** Dams within the Project area are small but do provide potential habitat for this species.
Spectacled Monarch (*Symposiachrus trivirgatus*) Black-faced Monarch (*Monarcha melanopsis*)	S	M	Both species generally occur mostly in dense vegetation, mainly in rainforests, but also in wet sclerophyll forests and other dense vegetation such as mangroves, drier sclerophyll forests, woodlands, parks and gardens (Higgins et al. 2006).	**Potential.** There are several database records for these species from the wider Project area. In general, the there is potential for some suitable foraging and breeding habits within the wider Project area.

Eastern Osprey (*Pandion cristatus*)	S	M	Mainly coastal habitats but can occur on inland rivers and lakes (Debus 2012).	**Potential.** Some suitable within or surrounding the Project area.
Pale Imperial Hairstreak (*Jalmenus eubulus*)	V		Species is confined to vegetation communities containing mature Brigalow which the larvae feed on (Valentine and Johnson 2012).	**Potential.** Potential habitat for this species within the wider Project area and two database records from the wider area.
Oriental Cuckoo (*Cuculus optatus*)	S	M	Rainforest, vine thickets, wet sclerophyll forest and open forest and woodland (Higgins 1999).	**Potential**. Potential habitat occurs in the project area associated worth woodlands and open forests.
Satin Flycatcher (*Myiagra cyanoleuca*)	S	M	Satin Flycatchers are mostly found in eucalypt forest, favouring wet forests, moist gullies and watercourses (Higgins et al. 2006).	**Potential.** This species may utilise the Project area during autumn/spring migrations but generally migrates along coastal areas. There is some potentially suitable foraging habitat within the Project area associated with taller woodlands and open forests.
Collared Delma (*Delma torquata*)	V	V	Occurs in soil cracks on heavy stoney soils west of Brisbane. In region known from Poplar Box on alluvial soils. Known from REs on land zones 3, 9 and 10 including 11.3.2, 11.9.10, 11.10.1 and 11.10.4.	**Potential.** Limited potential suitable habitat occurs in the Project area. No database records.
Black-breasted Button Quail (*Turnix melanogaster*)	V	V	The Black-breasted Button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum (They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest They may also be found in low, dense acacia thickets and, in littoral area, in vegetation behind sand dunes (Smith & Mathieson 2004).	**Potential** Limited suitable habitat exists in the Project area. No database records.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	Species is closely associated with the presence of sandstone escarpment country for roost sites.	**Potential.** Although no database record exist for the Project area, there is potential suitable foraging and roosting habitat within the wider Project area.

Species	Status*		Habitat preference	Likelihood of occurrence
	NC Act	EPBC Act		
Unlikely				
Curlew Sandpiper (*Calidris ferruginea*)	S	CE, M	Mainly occur on intertidal mudflats in sheltered coastal areas and also around non-tidal swamps, lakes and lagoons near the coast. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996).	**Unlikley.** Limited habitat available in the Project area.
Great Knot (*Calidris tenuirostris*)	S	CE, M	Typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats including inlets, bays, harbours, estuaries and lagoons. The Great Knot rarely occurs on inland lakes and swamps (Higgins & Davies 1996)	**Unlikley.** Limited habitat available in the Project area.
Bar-tailed Godwit (*Limosa lapponica*)		CE, M	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland.	**Unlikley.** Limited habitat available in the Project area.
Black-throated Finch (southern) (*Poephila cincta cincta*)	E	E	Occurs in grassy open woodlands near water. Prefers areas of intact woodlands with a variety of native grasses for year round feeding. Nests in large trees, sometimes in tree hollows and arboreal termite nests.	**Unlikely.** No suitable habitat exists in the Project area. No database records. EPBC online search only.
Star Finch (*Neochmia ruficaunda ruficauda*)	E	E	Occurs mainly in dense, damp grasslands bordering wetlands and watercourses, as well as open grassy woodlands near permanent water. Forages for seeds in tall native grasses (Higgins et al. 2006).	**Unlikely.** Habitat in the project area is generally unsuitable. Although once widespread this species is now very rare. No database records.

Species	Status*		Habitat preference	Likelihood of occurrence
	NC Act	EPBC Act		
Water Mouse (*Xeromys myoides*)	V	V	The water mouse had been documented in three distinct locations (Northern Territory, central coastal Queensland, south-east Queensland). Within these areas, they require similar habitat including mangroves and the associated saltmarsh, sedgelands, clay pans, heathlands and freshwater wetlands.	**Unlikely.** No suitable habitat exists in the Project area. No database records. EPBC online search only.
Yellow Chat (*Epthianura crocea*)	E	CE	The Yellow Chat (Dawson) inhabits marine plain wetlands that are subject to extensive seasonal inundation and varying degrees of both fresh and saltwater (tidal) influence. They typically occuppy portions of the marine plain that have a network of shallow drainage channels and depressions supporting a mosaic of vegetation that consists of grassland dominated by *Sporobolus virginicus* and/or *Paspalum distichum*, dense beds of rush or sedge and areas of bare or sparsely-vegetated mud and/or shallow water.	**Unlikely.** No suitable habitat exists in the Project area. No database records. EPBC online search only.

4.5.7.2 State Significant Species

In addition to EPBC Act-listed taxa, land within and adjacent to the disturbance area is known or likely to provide habitat for a number of State-listed species, including Koala and Short-beaked Echidna.

The Short-beaked Echidna (listed as 'Special Least Concern' under the NC Act) appears to be widely distributed and common within well-vegetated parts of the broader Project area. This includes parts of the mine disturbance area, where riparian vegetation and non-riparian woodland provide foraging habitat for this species.

Koala has been recorded within the Project area and, given the presence of suitable habitat (particularly remnant riparian eucalypt woodland), are likely to occur within the disturbance area. Suitable habitat for koala includes areas of remnant Narrow-leaved Ironbark woodland and riparian vegetation (including Forest Red Gum) along Deep Creek, an un-named tributary of Deep Creek, and Tooloombah Creek.

Though not recorded during previous surveys, land within and adjacent to the proposed disturbance area may also provide habitat for other state-significant species including the vulnerable Powerful Owl (*Ninox strenua*). If occurring within the disturbance area, habitat for the vulnerable Powerful Owl could include riparian open forest and vine-thicket along Deep Creek and/or Tooloombah Creek.

4.5.7.3 Other Significant Faunal Values

With extensive clearing of native vegetation in the Styx Basin and elsewhere in the northern Brigalow Belt, remaining areas of woodland and forest habitat within Project area are of considerable importance to native fauna at the local and regional level (as indicated in the *Biodiversity Planning Assessment for the Brigalow Belt*, DERM, 2008). Of particular importance in this regard are areas of riparian woodland/ forest linking more extensive areas of remnant vegetation in the west and east of the Styx River catchment including riparian vegetation along Deep Creek and Tooloombah Creek which bisect the proposed disturbance area. Other areas of riparian vegetation within the proposed disturbance area may also be of some importance for local movement of fauna within the upper Styx River catchment.

4.5.7.4 Potential Impacts

Despite extensive clearing and disturbance of vegetation previously carried out for grazing land uses, land within the proposed mine disturbance area provides habitat for a wide range of threatened fauna species.

Potential impacts of the proposed mine on threatened fauna species are identified as:

- Loss and fragmentation of habitat due to clearing;
- Degradation of remaining vegetation habitat due to edge effects associated with clearing;
- Degradation of habitat downstream of the proposed mine due to contaminated runoff;
- Introduction and/or spread of invasive plant or animal species;
- Direct mortality of fauna during vegetation clearing;

- Disturbance of fauna due to increased light and noise pollution; and
- Increased accidental mortality of fauna due to increased vehicular traffic.

Of these impacts, habitat loss and fragmentation are likely to be the most significant impacts that may occur as a result of Project activities. Establishment of the proposed mine will result in the loss and fragmentation of habitat known or likely to be utilised by conservation significant fauna within the mine disturbance area.

Clearing of riparian vegetation within the proposed disturbance area may also further inhibit fauna movement between areas of remnant vegetation in the west and east of the Project area, although connectivity between these areas of remnant vegetation is currently very limited. It is proposed, that riparian vegetation will be avoided, where possible, to minimise impacts on fauna movement corridors.

The establishment and spread of pest plant and animal species may impact on native fauna species and their habitat. Clearing of vegetation may result in fauna mortality, particularly less mobile or slow-moving species. It is proposed that a spotter-catcher will be present during clearing activities to minimise fauna impacts.

Increased accidental mortality on roads and disturbances created by increased noise and light pollution may also occur; however, it is expected that these impacts will be minimal.

Contaminated runoff may result in the bioaccumulation of toxins which may affect the health of higher order predators feeding on fish and other aquatic fauna within Deep Creek and the Styx River. In addition, contamination of sediments could pose a threat to migratory shorebirds feeding on tidal flats near the mouth of the Styx River. Treatment of water discharged from the mine site will be undertaken to minimise water quality impacts.

It is expected that potential impacts on fauna species can be appropriately managed through implementation of fauna control strategies to avoid or minimise environmental harm.

4.6 Noise and Vibrations

The noise environment in the vicinity of the Project can be characterised as ‘very rural’, with only mild sources of activity noise, mostly local activity at dwellings and plant and machinery used for agriculture and livestock. The Bruce Highway cuts through the proposed MLA area and the North Coast Rail Line is located approximately 1.5 km from the northern boundary of the proposed MLA area. These are likely to have an influence on the acoustic environment; however, traffic is intermittent on both road and rail. Environmental noise (wildlife, flora, wind) is the predominant noise in the absence of human environment noise.

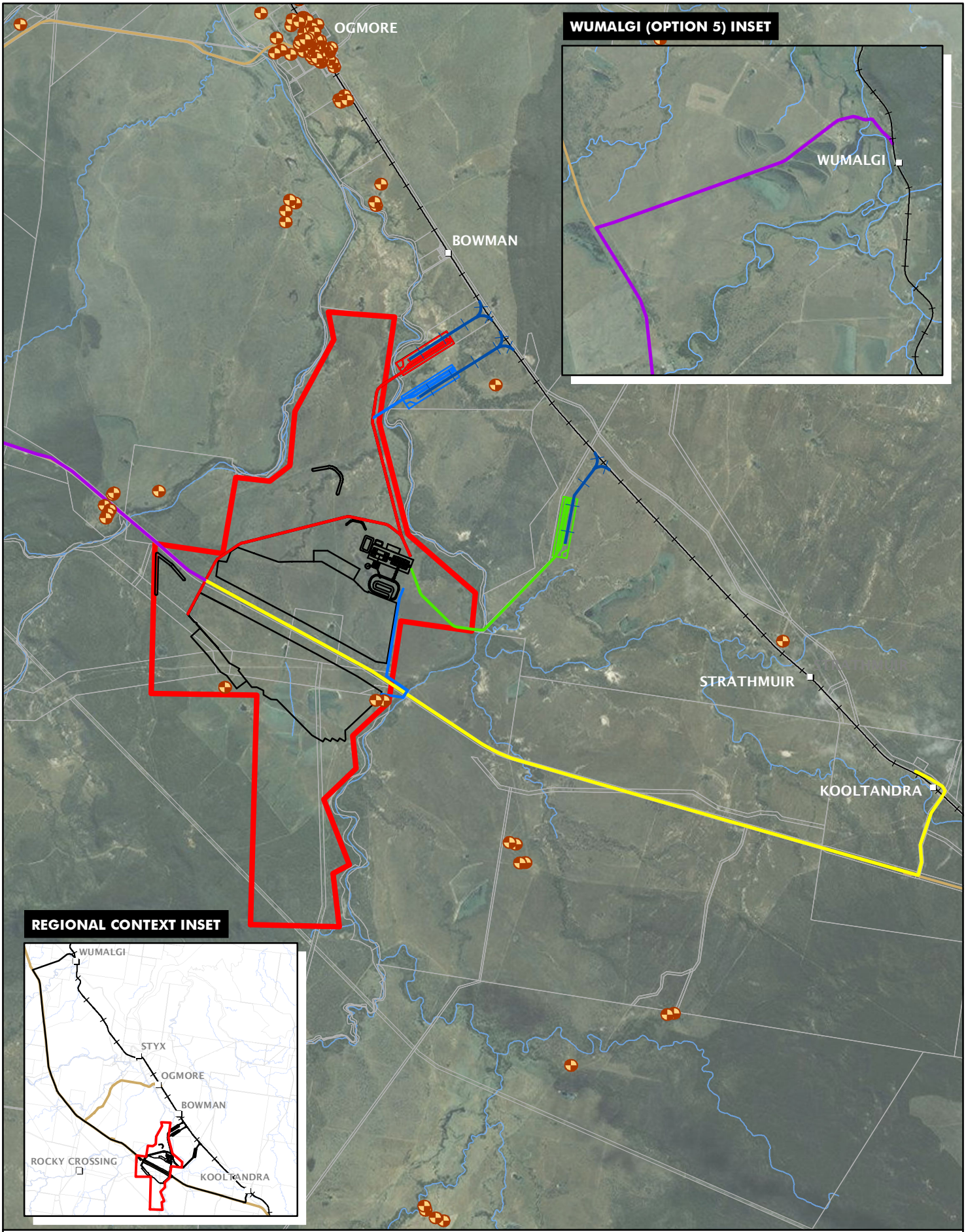
Vibration due to construction and blasting activities has the potential to effect services such as buried pipework, electrical and telecommunication cables.

4.6.1 Potential Impacts

Noise emissions have the potential to impact upon neighbouring properties, communities and local wildlife through disruption. At this stage, there is little existing noise emission data; however, noise levels will be monitored prior to commencement of the project to quantify typical noise levels. Noise monitoring will be established within the project area concentrating near noise sensitive receptors. The locations of noise sensitive receptors in the vicinity of the Project that may be impacted by noise emissions from Project activities are shown in Figure 4-12.

Potential noise and vibration impacts are expected to occur from use of mobile equipment including haul trucks, graders and front end loaders, activities including drilling and blasting and infrastructure such as coal processing plant, conveyors, transport corridor, rail loop, and the proposed TLF.

Noise emissions will be managed in accordance with the guidelines outlined by EHP in the *Application requirements for activities with noise impacts* guideline (EHP, 2016c). Emissions will be monitored during the construction process and during operation of the mine and TLF. Mitigation measures to reduce noise emissions will be identified during the EIS process. A complaint resolution process will also be implemented for all potential impacts from the proposed project.



Legend

- Sensitive Receptors
- Styx Coal Project Mining Lease Application Area
- Proposed mine infrastructure
- Cadastral boundary
- North Coast Rail Line
- Main road
- Watercourse
- Proposed Rail Siding

TLF Rail Options

- TLF / Haul Road Option 1
- TLF / Haul Road Option 2
- TLF / Haul Road Option 3
- TLF / Haul Road Option 4
- TLF / Haul Road Option 5

N

0 1 2 km

Scale @ A4 1:80,000
Date: 14/12/16
Drawn: Gayle B.

Figure 4-12
Sensitive receptors

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\BES150160.01 R2 sensitive receptors.mxd 12/14/2016

4.7 Air Quality

No quantitative air quality data is available for the Project area. However, air monitoring data is available for a similar rural site at Mount Larcom, located 30 km northwest of Gladstone. This site was investigated by DERM (2009a) from January 2009 through to May 2009 as part of the *Clean and Healthy Air for Gladstone* project. Low levels of industrial emissions were detected from Gladstone, and therefore the data is likely to represent an upper bound of typical pollutants that might be found in the Project area.

The main air emissions from mining operations are caused by wind borne dust, haul road generated dust, materials handling, stockpiles and transfers. As part of the EIS, a detailed air quality assessment will be conducted and the results of the assessment will be used to develop effective air quality mitigation measures.

4.7.1 Potential Impacts

Sensitive receptors in the vicinity of the Project are likely to include residences (houses and homesteads), farm sheds and working areas, and broader farmland areas. The locations of potential residential receptors identified during preliminary assessments are shown on Figure 4-12. Potential impacts to sensitive receptors will be determined during the development of the EIS

The majority of air pollutants from such sources will include particles less than 10 µm (PM_{10}) and 2.5 µm ($PM_{2.5}$), visibility reducing particles (generally range from 0.1 to 2.5 µm) and other pollutants such as carbon monoxide and sulphur oxides. Air pollutants as a result of industrial processes are expected to be negligible given the distance of the Project area from any large industrial sites.

Greenhouse gas emissions may be generated from equipment and vehicles during construction activities and from mine and stockyard operations. Management procedures for the use and maintenance of all equipment and vehicles used on construction sites will be developed and implemented to mitigate this impact. Regular monitoring and inspection of vehicles and equipment will be undertaken to ensure they are in sound working order.

Potential impacts of the Project on air quality and sensitive receptors will be fully evaluated during monitoring and dispersion modelling to be conducted as part of the EIS. The assessment will determine baseline dust conditions to provide additional information for the prediction of potential impacts. Mitigation measures that will be considered include the use of water trucks for dust suppression, progressive rehabilitation, water sprays on crushers and conveyor transfer points.

The EIS will consider direct greenhouse gas emissions associated with the construction and operation of the project infrastructure and will also consider indirect emissions associated with coal consumption. Measures to reduce greenhouse gas emissions will be identified and integrated into the operational procedures as part of the EIS process.

Given the size of the project and isolated nature of potential emission generation, the impacts on air quality associated with construction activities are expected to be low.

4.8 Waste Management

The Project will generate waste materials in a number of categories during construction and operation. These wastes will be managed to minimise adverse impacts on environmental values and environmental nuisance as a result of mining activities.

Commercial and industrial waste is generated from a range of activities including mining. Construction and demolition waste is generated from works such as building, alteration or demolition of structures including infrastructure such as roads, rail, sewage, water or electricity infrastructure. It is expected that the Project will generate waste materials in these categories during both construction and operational activities and disposal of these wastes will be subject to the provisions of Queensland waste legislation.

4.8.1 Potential Impacts

Waste material have the potential to impact the receiving environment through contaminating soil, habitat and water resources. In addition, the amenity of sensitive receptors may be impacted due to visibility of waste materials in the environment. While waste produced during the construction phase will be of a relatively short duration (when compared to the operational phase), waste will continue to be produced during the operation and decommissioning phases of the Project.

Potential impacts may include:

- Land contamination;
- Human and environmental health impacts;
- Degradation of vegetation communities and fauna habitat;
- Deterioration of surface water and groundwater quality;
- Airborne pollutants and odour;
- Impacts on existing and future land uses; and
- Reduction in visual amenity and residential amenity.

During the EIS process, potential waste facilities will be identified and an assessment will be undertaken to determine if the facility has the capacity to receive Project wastes. The EIS will also identify management measures, which target the reduction of generated wastes and ensure the onsite wastes do no enter the environment and minimise subsequent impacts.

4.9 Safety and Health

The Proponent will implement a rigorous SHMS which will set out a framework and detail safety procedures to manage the safety and health of its employees and contractors. The SHMS will comply with relevant legislation, standards and codes of practice.

A Project Risk Register and appropriate controls, including training, engineering, design, procedural and physical controls will be in place to manage any onsite hazards.

4.9.1 Potential Impacts

The Project safety and health related impacts are synonymous to open cut coal mining activities. The workers and sensitive receptors may potentially be impacted from exposure to particulates and gases/vapours, noise, mining accidents and vehicle collisions. Potential impacts include illness, injury and death.

4.10 Cultural Heritage

The Cultural Heritage bodies for the Project area are the Darumbal Enterprises Pty Ltd and Barada Kabalbara Yetimarala People. The Darumbal People have a current Native Title claim over the area where the TLF Options 1 – 4 are proposed and the Barada Kabalbara Yetimarala People have a current Native Title claim over the area where the mine pits and ancillary infrastructure are proposed. The area associated with TLF Option 5 has not had a Native Title claim determined as yet.

A search of the Australian Heritage Place Inventory and Aboriginal Cultural Heritage Database and Register did not identify any listed area within the immediate Project area.

The activities associated with exploration and mining within the Project site have been assessed as 'category 5', being activities causing additional ground surface disturbance. Category 5 activities generally carry a high risk of harm to cultural heritage values and should not proceed without cultural heritage assessment.

In accordance with the cultural heritage duty of care, an archaeological inspection was conducted within the MLA area during preliminary exploration drilling undertaken in June/July 2011. A single Indigenous cultural heritage site was identified within the MLA area. The site comprised an 'isolated find' of a single stone artefact generally considered to be of very low scientific value. No other archaeological sites were recorded during the inspection of drill pad sites.

The Project area can be described as largely flat, featureless and cleared of vegetation. There is minimal change in relief across the site. The only significant drainage features are networks of small ephemeral waterways that run in a southwest direction across the site.

Typically, such landscapes tend to be of low to very low archaeological sensitivity, reflecting very sparse past occupation. That is, it is unlikely that archaeological sites would be found in such terrain, because in the past they were rarely used as camping places and were generally only visited sporadically.

Natural vegetation for the study area has been cleared for farming and much of the area has been ripped.

4.10.1 Potential Impacts

Potential impacts on cultural heritage values within the MLA are expected to be low given the low archaeological sensitivity of the landscape and the very low scientific value of the artefact find. It is considered that further surveys are unlikely to reveal many more finds considering the low archaeological sensitivity of the general landscape.

The site of the artefact find will be avoided and left undisturbed where possible. Should further development be proposed at this site in future, the find will be salvaged by a qualified archaeologist and in consultation with the Aboriginal parties for the area.

4.11 Socio-Economics

The agriculture, forestry and fishing sector (which can be assumed to be predominately beef cattle) is the main employer in the local area of the Project. Although well known for its cattle production, the region has a more diverse and mature economy, with employment levels highest in retail trade, health care, manufacturing, construction, transportation and public administration.

The Project will positively contribute to the local (Ogmore, Marlborough and St Lawrence) and regional area with increased direct employment opportunities and indirect opportunities through the ongoing requirement for services and support.

During construction and operations, the Project will require the hiring of 200 and 250 full-time employees, respectively. Given the relatively small scale of the Project, and considering the majority of employees will be local it's not expected that adverse social impacts will arise as a result of the Project.

4.11.1 Potential Impacts

Local procurement will generate local business activity and generate indirect employment. A significant proportion of the goods and services are expected to be sourced from Mackay and Rockhampton, and will therefore benefit Central Queensland. Mackay in particular has a large pool of mine contractors and an established capacity to serve the coal mining industry.

The mine will have a relatively small but negative impact on cattle production. Five properties will potentially lose grazing land. These properties represent a relatively small proportion of grazing land in the Styx Basin and the local area.

Neighbouring cattle properties may be impacted by dust, which may reduce pasture production and its palatability, particularly during dry periods when the dust is not washed off on a regular basis. Given the extensive nature of cattle production systems in the area the actual impact on pasture production and cattle productivity is expected to be low. Furthermore, any decline in cattle production will be low relative to the economic benefits derived from the Project.

Most impacts are considered to be minimal primarily due to the relative isolation of the Project; the predominantly non-resident workforce; and the limited number of residents living in the vicinity of the Project.

The impacts on Indigenous people are regarded as low for the same reasons as above (isolated Project, size and predominantly non-resident workforce), and because few of the traditional owners are believed to reside in the local area.

4.12 Traffic and Transportation

The Project construction and operational activities will require the transport of plant and equipment, construction material, heavy vehicles and oversized loads and employees from various locations. The transport methods are being assessed and negotiations are underway with local landholders and Queensland Rail to access and to utilise the existing North Coast Rail Line that is located adjacent to the mine site to transport product coal to the port. The preferred option is to transfer coal internally to a rail loop and TLF, or by transporting coal via truck to nearby rail sidings which will be upgraded as required. Locating the TLF at an external rail siding will require truck haulage along the Bruce Highway to Wulmagi to the north of the MLA area or via the Bruce Highway to Kooltandra to the south of the MLA area.

Access to the south and north pits (i.e. either side of the Bruce Highway) is proposed via a level crossing. The location and design of the crossing is currently under investigation as part of the Project's feasibility assessment.

4.12.1 Potential Impacts

The increased traffic in the Project area and in the wider region has the potential to result in a number of potential impacts. The Bruce Highway will be the major road that will be utilised for the Project activities. Depending on which TLF option is selected one or more local roads may also be utilised by haul trucks. A traffic impact assessment will be conducted as part of the EIS process to identify and mitigate potential traffic impacts.

At this stage of the project design, no estimates are available for the likely number and type of transport trips required for the project. Procedures for the movement and transport of vehicles and personnel during the construction and operation of the mine will be prepared to ensure that these traffic movements do not cause unnecessary damage to local or regional roads. Traffic movement on local roads will be minimised where practicable and restricted in areas of high sensitivity.

A Road Use Management Plan (RMP) and Traffic Management Plan (TMP) will be developed in conjunction with relevant State and local road authorities. The RMP and TMP will be adopted by the Project's management team and will be implemented by the workforce and contractors delivering goods to or removing goods from the site to ensure that Project traffic movements do not cause unnecessary damage to local or regional roads.

5 Stakeholder Engagement

The Proponent will prepare a consultation program prior to the commencement of construction activities to ensure Project stakeholders have access to relevant information, are able to voice their concerns and suggestions in relation to the Project and its impacts, and participate as valued partners in the development and operation of the mine. Affected and interested stakeholders to be included in consultation include:

- Property owners within and immediately adjacent to the mine footprint;
- Mining and petroleum tenement holders within and immediately adjacent to the Project;
- Local and regional service providers;
- Livingstone Shire Council, Isaac Regional Council and Rockhampton Regional Council,
- State government agencies;
- Commonwealth government agencies;
- Community interest groups/non-government organisations;
- Emergency service groups; and
- Aboriginal parties (Darumbal Enterprises Pty Ltd and Barada Kabalbara Yetimarala People – Area A).

The consultation program will include:

- Establishing mechanisms for providing access to Project information and communicating key information to stakeholders;
- Establishing a grievance and dispute resolution mechanism for employees, contractors and other stakeholders; and
- Involving stakeholders in the identification of social impacts, the preparation of social mitigation strategies, the monitoring of mitigation strategies and an annual process of review (to be described in detail in the draft Social Impact Management Plan).

The above control strategies will be described in detail in the EIS and appropriate management strategies outlined in the EIS commitments chapter. The management measures, will be consistent with the Queensland Government Coordinator-General Social Impact Assessment Guideline 2013 and the tools provided by the International Council on Mining and Metals (ICMM).

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