Expansion to Limestone Quarry on

Mining Lease 08/06 Sub-Lease 3H/034
Exmouth WA

Exmouth Quarries and Concrete

Assessment on Proponent Information

10 January 2012

Prepared for
Exmouth Quarries and Concrete
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Expansion to Limestone Quarry on Mining Lease 08/06 Sub-Lease 3H/034

Assessment on Proponent Information

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Executive Summary

Introduction

Exmouth Quarries and Concrete proposes to expand operations on the Sub Lease 3H/034 limestone quarry located 8Kms southwest of Exmouth.
The project provides for the removal of rock and processing to obtain large sized armour rock with by-product of aggregates suitable for concrete production and road construction.
The area required for mining comprises approximately 1.41ha of previously mined rock. This portion was mined for the original Exmouth Marina development and later for the amour on the Canal development.
The proposal intends to increase the size of the mined area to a total 3.7Ha being impacted in the mining operation, this is inclusive of the previously mined area, Laydown and rehabilitation processes areas. The total area of the proposed mining activity will affect less than 3% of the sub lease. The whole sub lease area comprises approximately 96Ha.

Assessment process and EPA advice

Exmouth Quarries and Concrete Mining Proposal for ALCOA Sub Lease ML 08/06 SL 3H/034 was referred to the Environmental Protection Authority ("EPA") under Section 38 of the Environmental Protection Act 1986 in March 2011 by the Proponent.
The EPA decision was to formally assess the Project at Assessment on Proponent information (Assessment No. 1874), Category A – EPA prepared scoping guideline issued, 05 August 2011.
Consultation concerning drafting guideline occurred with Exmouth Quarries and Concrete prior to issue of scoping guidelines on 5 August 2011 with second draft proponent submission on 11November 2011.
Final Proponent API submitted on the 3 January 2012.

This document describes the assessment of:

- The proposed quarrying operations
- Assesses the potential environmental impacts with consideration to the protection of the Exmouth Water Supply
- Management measures to ensure the limestone quarry operates according to best management practice
- Management measures for the rehabilitation of disturbed areas

Project Description

The project provides for the removal of rock (limestone) for armour and landscaping.

The key activities are:

- Mitigation of environmental impacts caused by previous mining operations and construction of Laydown area
- Conventional quarrying, earthmoving and blasting will be used to develop the open pit quarry
- Excavation of material and screening processes
- Management and mitigation of the environmental impacts of mining activities restoration and rehabilitation of mined areas
- At present annual requirement per year would not exceed 10 000 tons, this includes landscaping and rock supplies.

The Key Project elements are outlined in Table ES1.

Table ES 1 Key Project Elements for Expansion to Limestone Quarry

Element	Description
Project Life	5 – 20 years(dictated to by demand)
Total Limestone mined	Dictated by demand
Mining Rate	*10 000* tons per year
Pit Depth	To 50.1 m AHD
Pit Area.	3.7 Hectares.
Ore Processing	screening
Water Requirements	100 kl/day.
Access Road Length	3.16km
Total Area Disturbed	3.7 Ha
Workforce (Permanent)	4
Workforce (Construction)	2
Construction Period	2 months

Stakeholder consultation

Exmouth Quarries and Concrete has consulted with stakeholders (including government agencies) to determine the significance of the environmental impacts and concerns directly related to the Project (see Table15).
During the preparation of this document and during earlier studies associated with the project, the following groups and agencies were consulted;

- Dept Of Environment and Conservation
- Dept of Water
- Shire of Exmouth
- Dept of Mines and Petroleum
- Organisation/Group
- Cape Conservation Group
- Water Corporation

Various individuals were also contacted including;

- Dr Carl Grant (formerly ALCOA)
- Two Indigenous elders
- A local speleologist with detailed knowledge of the Cape Range and cave systems,
- A local amateur entomologist with extensive knowledge of the Troglobitic Fauna on North West Cape
- Local amateur Botanist with extensive knowledge of the flora in the Cape Range
- Local DEC Officers
- Gnulli Aboriginal Group.

Environmental impact assessment and management

This API is based on a risk assessment approach to characterise environmental factors, determine potential impacts and develop management measures.

The key significant environmental issues identified in relation to the proposed quarry are:

- Protection of the Exmouth Water Supply
- Groundwater Quality - monitoring
- Mine Rehabilitation

Ten additional environmental factors were also identified.

- Vegetation and Flora
- Terrestrial Fauna
- Troglobitic Fauna
- Stygofauna
- Karst System
- Dust
- Aboriginal Heritage
- Soils and Landform
- Visual amenity
- Surface water

Protection of Exmouth Water supply

The proposed quarry is located in the water catchment of Stony Creek within the Exmouth Water Reserve and the Exmouth Central Subarea Borefield. The Central Borefield is located to the west and south of the township and extends approximately 7kms along the eastern flank of the Cape Range. Exmouth's water supply is sourced from this Borefield. The Water Reserve is managed as Priority (P1) area.
The site characteristics are defined in Table ES2.

Table ES 2 Groundwater characteristics Expansion to Limestone Quarry

Groundwater Aquifer	The aquifer supplying the Borefield is located within the Mandu Limestone Formation, which contains an unconfined aquifer of a Karstic nature. The recharge area for the Exmouth Town Water Supply Reserve consist of the area overlying the wellfield itself and the up gradient area to the west, which roughly aligns with the axis of a groundwater divide.
Groundwater Aquifer Depth	Depth to groundwater beneath the proposed quarry floor was assumed to be approximately 50 m; In unconfined aquifers (i.e. surficial and fractured rock aquifers such as the proposed quarry site), the depth to the top of the aquifer was assumed to be the water table level. This and the depth and thickness were obtained by reference to relevant reports and bore records,however Water Corporation observation Bore 8/08 located 800m east from the quarry site has level of 85.55 mbotc (Meters below Top of Casing). Water levels in the closest production bore(14/97) reached 2.5m AHD following heavy rain in 2008.
Surface Water	Quarry site is situated within the Stony creek catchment and adjacent to the Mowbowra creek catchment. The proposed area contains one closed gully on the south east, and creek tributary, at the bend located within the northern boundary of the proposed mining area. Permanent water bodies within the proposed area do not occur. Ephemeral creek rainfall infiltration is rapid with only heavy rainfall producing creek flow. The impact on Stony Creek catchment is less than 1%.

Groundwater Quality – monitoring

The water table lies approximately 2 -3 metres above present sea level near the coast and rises to 15m altitude towards the inland ranges. The upper part of the aquifer is Karst and has high permeability *(Water Corporation, 1996*). Aquifer recharge is from direct infiltration of rainfall or infiltration of stream runoff where channel beds are coarse gravel, the estimated recharge for the area west of the proposed quarry and Water Corporation wellfield is 25 mm/year (*Colman, R. 1994).* Groundwater is discharged from the aquifer to the ocean or springs near the coast, or by evapotranspiration and wellfield abstraction. Hydraulic gradients are generally low and decrease toward the coast. (Martin *1990)* estimated the hydraulic gradient to *be 1.7 x 10-4.* A saline interface extends inland for about 5 km from the coast.
Groundwater flow near the proposed quarry is in an easterly direction from the Cape Range toward the Exmouth Gulf.
The Mandu Limestone interface is located well below the excavation proposed; geological exposure over the proposed area is Tulki and Trealla Limestone. Drilling undertaken by mineral exploration and the Water Corporation near the previous and proposed site has not identified elevated water tables or perched water systems within the proposed quarry site. There is no synoptic picture available for the groundwater contribution to base flow. Therefore, no compendium of this ecosystem dependence on base flow can be mapped as such. The proposal does not include groundwater abstraction on site.
The proposed Groundwater Monitoring Programme is being initiated by Exmouth Quarries and Concrete with guidance from Dept. of Water and the Water Corporation to ensure regulatory requirements are met before the initiation of the programme.
The monitoring network will monitor within the Exmouth Water Supply Central Subarea utilising current Observation Bores.
Groundwater sampling will be undertaken on a quarterly basis from the groundwater observation bores for analysis of the parameter: Industrial hydrocarbons C, Nutrients and TFSS, Also insitu Water levels, temp & conductivity..
The groundwater monitoring is undertaken based on the requirements in the National Water Quality Management Strategy No. 7a *AUSTRALIAN GUIDELINES FOR WATER QUALITY MONITORING AND REPORTING, ANZECC & ARMCANZ* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand), (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* and ANZECC, ARMCANZ- *Australian Guidelines for Water Quality Monitoring and Reporting*, 2000; and the Australian New Zealand standard AS/NZS5667.1:1998: Water quality – Sampling Guidance on design of sampling programs, sampling techniques and the preservation and handling of samples (*Standards Australia, 1980*).

Mine Rehabilitation

The Mine Rehabilitation and Closure Management Plan outlines a plan for decommissioning the facility and mitigating impacts once mining activities have ceased. The preparation of a rehabilitation and closure strategy during development of the Project is an integral part of the closure design process. This approach to mine planning recognises that mining represents a temporary use of the land and that appropriate closure of the operation is in line with the sustainable use of available resources.
This *Mine Rehabilitation and Closure Management Plan* carry forward the concepts laid out in the manner that supports the Environmental Impact Assessment (EIA) process.
The *Mine Rehabilitation and Closure Management Plan* addresses closure activities associated with four different scenarios:

- preparation and planning for closure during operation;
- rehabilitation measures during closure
- rehabilitation measures during states of inactivity
- activities in the post-closure phase

A Mining Plan and Quarry Environmental Management Plan have been developed in consideration of guidelines for Mine Closure and Mine site Rehabilitation guidance material, Legislative requirements and subsequent regulations.
The *Mine Rehabilitation and Closure Management Plan* will be reviewed and updated as appropriate on a periodic basis following operational experience and assessment of the results of closure trialling. It will also be reviewed and updated as part of the management review process, since environmental legislation, reclamation practices, and mine operations, are expected to change with time, as may other aspects of the *Mining Act, 1978, that* will need to be addressed in later phases of the Project This will ensure that the Plan addresses the current mine plan and legislation.

Environmental management
The Proponent will operate the proposed limestone quarry using “best practice” with continuous improvement through an established Environmental Management System (EMS). This approach will enable better planning and management in conformance with the Environmental Protection of Cape Range Province Position Statement No. 1. (EPA1999a).

Environmental management system
Exmouth Quarries and Concrete are a small family owned company and that are implanting achievable environmental outcomes at their other quarry and Batch Plant operations. This project indeed increases conformance as since the development of Environmental Laws (EQC first began operation in 1987) EQC have increased knowledge and planning processes to incorporate Environmental values including the implementation of an *Environmental Management System in 2009(ISO14001)* to attain accreditation. I*SO14001* is an internationally recognised continuous improvement model, the key elements of which include assessing environmental risk and legal requirements, developing objectives and targets for improvement.
The project from initiation has been developed ensure conformance concerning the environmentally sensitive nature of the project site.

Proposed outcome based conditions
For the management of relevant key environmental issues Exmouth Quarries and Concrete proposes outcome- based conditions detailed in Sections 5, 6 & 7 of this document.

Conclusion

The potential key environmental impacts and the proposed management measures are as follows:

- The proposal intends to increase the size of the mined area to a total 3.7Ha being impacted in the mining operation, this is inclusive of the previously mined area, Laydown and rehabilitation processes areas
- The area required for mining comprises approximately 1.41ha of previously mined rock
- The total area of the proposed mining activity will impact on less than 3% of the 96ha sub lease
- The quarry face will be constructed and move progressively forward with rehabilitation occurring directly behind as the face progresses
- The proponent proposes to progressively batter down the created slopes (rehabilitation) through placement of extracted material (overburden remains from previous quarrying) to create a geotechnical stable and safe final landform with a gentle to medium slope consistent with the surrounding topography
- The proponent will install cut-off drains as well as the containment of dirty water in a sediment control structure within the operational area of the project to eliminate any uncontrolled runoff
- Each ephemeral water course will be restored and water redirected into the natural channel once rehabilitation of the disturbed area is satisfactorily stable
- All erosion and sediment controls will be implemented in advance of clearing and stripping operations, including the installation of earth banks around the perimeter of the working area
- Groundwater levels will be monitored monthly for the first two years following commencement construction to assess seasonal, natural, groundwater fluctuations
- Restoration of mined areas to a state based on surrounding undisturbed vegetation communities that, are resilient, self-sustaining and where ecosystem processes have been re-established and to increase knowledge and understanding of flora and fauna to provide for best practise management of the lease and to monitor impacts
- Stabilization of slopes so that no hazard remains after final closure
- Reduction or elimination of the need for a long-term management program to control erosion, water quality and to minimise the long-term environmental effects
- Clean-up, treatment, or restoration of contaminated areas (e.g. soils contaminated by oil or fuel spills or spills of reagents) with contaminated material excavated and disposed of in an acceptable manner wherever necessary
- Surfaces profiled and designed to achieve long-term stability under peak run-off conditions based on emepheral creek flow patterns
- Surface areas to be vegetated or otherwise stabilised to minimise wind and water erosion:
- Provision of site conditions to allow the natural invasion of indigenous vegetation on the site to begin establishment of a vegetation base that will enable natural species to begin the process of recovery toward the quality and productivity of the adjacent environment

The risk factor assessment of potential impacts their significance, context and Exmouth Quarries operational and procedural management are shown in Table ES3.

Table ES 3 Risk Factor and Potential Impacts

Risk Factor	Potential Impacts	Significance of Emissions	Socio-political Context	DEC regulations (EP Act –Part V)	Legislation	EQC Principal Operational Management	EQC - *EMS* Procedural Management
Native Vegetation Clearing	Removal of vegetation Groundwater - Discharge during runoff events	Loss of native vegetation Impact on Groundwater regime and quality	There is potential for wind-blown sand and dust	Clearing Permit	*Environmental Protection(Clearing and Native Vegetation)Regulations 2004* *Guideline for the development and implementation of a dust management program DEC 2008*	Minimise disturbed areas and work spaces. Retain as much as is practicable remnant vegetation. Dampen internal operational roads Provision of barriers, wind and amenity buffers.	*Dust emissions* *Preventive and Corrective Action* *Environmental Aspects* *Monitoring and Measurement*
Dust Emissions Operation	Visual amenity Foliage coverage on surrounding flora	Dust event due to weather conditions Community complaint relating to dust	Possible amenity impacts	Operating Licence	*EPA publication Guideline for Separation Distances (2007)* *Environmental Protection Regulations 2004* *Guideline for the development and implementation of a dust management program DEC 2008*	Management and control of any incidental emissions	*Site Considerations* *Preventive and Corrective Action* *Environmental Aspects* *Monitoring and Measurement*
Discharges to Land	Site contamination and generation of contaminated wastewater/ Stormwater	Potential pollutants discharge off site. Impact on Groundwater regime and quality		Operating Licence	*Guideline for the development and implementation of a dust management program DEC 2008* *Environmental Protection (Unauthorised discharges)Regulations 2004*	Site planning has accounted for intense Stormwater events with silt traps and engineered flow lines. *Structural and procedural controls site.*	*Wastewater / Stormwater management* *Storage of Materials and Hazardous Substances* *Accidental Leaks and Spills* *Environmental Aspects* *Monitoring and Measurement*
Discharges to Water	Site contamination and generation of contaminated wastewater/Stormwater Discharge during runoff events.	Potential groundwater pollutants discharge off site. Alkaline wastewater Impact on Groundwater regime and quality		Operating Licence	*Environmental Protection Regulations 2004* *Environmental Protection (Unauthorised discharges)Regulations 2004* *Rights in Water and Irrigation Act 1914* *Country Area Water Supply ACT DoW 2008*	*Structural and procedural controls site.*	*Wastewater management* *Stormwater management* *Accidental Leaks and Spills* *Environmental Aspects* *Monitoring and Measurement*

Risk Factor	Potential Impacts	Significance of Emissions	Socio-political Context	DEC regulations (EP Act –Part V)	Legislation	EQC Principal Operational Management	EQC - *EMS* Procedural Management
Solid Wastes	Site contamination and generation of contaminated wastewater /Stormwater	Potential groundwater pollutants discharge off site Impact on Groundwater regime and quality		Operating Licence	*General provisions of the Environmental Protection ACT 1986* *Environmental Protection (Prescribed Waste) Regulations 1998*	*EMP Structural and procedural controls site*.	*Storage of Materials and Hazardous Substances* *Solid Waste* *Environmental Aspects*
Hydrocarbon/Chemical Storage	Exmouth Quarries and Concrete does not currently plan to store fuel or conduct equipment servicing on site but will store vehicles and Plant on site	Impact on Groundwater regime and quality		Operating Licence	*General provisions of the Environmental Protection ACT 1986* *Occupational Health and Safety Act 1984* *Occupational Health and Safety Regulations 1996* *National Model Regulations for the Control of Workplace hazardous Substances [NOHSC 105 (1994)]* *National code of Practice for the Handling and Storage of Dangerous Goods 2000*	All plant, operational equipment, vehicles or other items shall be stored within the site. Drip trays will be provided for stationary plant. All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or removed from the site. All fuel, oil and other hazardous substances shall be confined to demarcated, bunded areas	*Storage of Materials and Hazardous Substances* *Storage of Fuels/Equipment Maintenance* *Waste Storage Areas* *Accidental Leaks and Spills* *Environmental Aspects*
Noise	Delivery of materials in truck, trailers and tankers to and from site Operational movement within quarry Operational equipment		Possible amenity impacts		*Environmental Protection (Noise) Regulations 1997*		*Noise* *Non-conformance and Corrective/Preventive Action* *Preventive and Corrective Action* *Environmental Aspects*

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1. Introduction

Exmouth Quarries and Concrete proposes to establish and operate a small-scale (3.7ha) limestone quarry located 8Kms southwest of Exmouth. The proposal intends to increase the size of the mined area to a total 3.7Ha being impacted in the mining operation, this is inclusive of the previously mined area, roads and rehabilitation processes areas. The total area of the proposed mining activity will affect less than 3% of the sub lease. The project provides for the removal of rock to for armour and landscaping.
The development of the EQC quarry will involve a wide range of activities. These will include the development of open pit quarry, screening operations and Laydown areas. The management and mitigation of the environmental impacts of mining activities; restoration and rehabilitation of mined areas; archaeological surveys, assessments, and other cultural heritage preservation activities; environmental surveys, assessments and data sharing; mitigation of environmental impacts caused by previous mining operations; and, support for various local and regional developments; and other activities.
Conventional quarrying, earthmoving and blasting will be used to develop the quarry. Processing activities proposed are screening of rock.
At present annual requirement per year would not exceed 10 000 tons, this includes landscaping and rock supplies.

1.1 Project Justification

National and State Benefits
Exmouth Quarries and Concrete development of the Sub Lease quarry will result in economic benefits for the community through:
The State Government receiving additional revenue in the form of royalties, payroll tax and other charges and increased income flow to the Federal Government though tax revenue (personal income tax and corporate tax.
Regional Benefits
The proposed quarry will provide local employment and trade opportunities for the Exmouth area. Four direct jobs will continue and indirect employment will be generated with the service providers. The development of the quarry will assist in the commencement of other developments in the area such as a boat ramp or barge facility or marina extension, which will aid the economic development of the area.

1.2 Alternative Limestone Supply

M08/62
Exmouth Quarries and Concrete currently operate a limestone quarry, M08/62.
The limestone source available at M08/62 is of rock not suitable for rock armour.
Current operation of M08/62 is to supply of aggregate for construction and road base.
The close location of Sensitive Receptors in the Preston Street Precinct and the location within the Drinking Water Reserve inhibit expansion of this particular lease to the foothills to extract suitable armour rock.
M08/46
Tenement is currently utilised as Laydown stockpile and processing area for M08/62.
Quarrying activity on this lease would not produce suitable rock for armour.
Close proximity of Sensitive Receptors also excludes the tenement expansion to the north.
M08/06 SL3H/344
Alcoa of Australia is the tenement holder for 08/06 and entered a sublease agreement for portion 3H/034 of approximately 96Ha to Exmouth Quarries and Concrete.
This portion of the sub-lease of 3H/034 within the Mining Lease of 08/06 has been previously mined. In March 1991, the Dept of Transport submitted a proposal for an inland marina, provision for an associated residential holiday resort and commercial facilities, and a residential subdivision inland form the marina development at Exmouth (*EPA Bulletin 498*). The EPA formerly assessed the proposal. The proposal included the development of a quarry site to provide armour stone for the marina breakwaters and groynes. Subject to a number of Environmental Conditions the previous mining proposal was found to be environmentally acceptable and environmental approval was issued 20January 1992.

1.3 Justification of Site

The location of the quarry, close to EQC current operations, extensive local knowledge and experience by the Owners of EQC have resulted in this site being selected as the most favourable socially, economically and environmentally.
Pioneer Quarry supplies Exmouth town site with road base and backfill material.
Limestone cobbles and boulders are taken from creek beds leading onto M08/216 and are directly processed under environmental controls required by the Shire and Part IV Environmental Protection Act, 1986 Environmental Impact Assessment. Part V Environmental Protection Act, 1986, Environmental Management Schedule 5 of the Environment Protection Act 1986 and Environmental Protection Regulations.
Only small volumes of material are processed.
EQC considers that the Pioneer Quarry operation is not capable of producing the volumes and products of large limestone that are required to satisfy the current and future demands in the Local area.
EQC have concluded that none of the locations described above offer a viable alternative to the proposed quarry location. The reasoning is clearly that the other locations cannot meet the limestone requirements that the proposed quarry can.
A better environmental outcome does not appear to be indicated, as the same environmental issues appear to apply to the alternatives located in and surrounded by the Cape Range and its environs, all are located within the Exmouth Peninsula.
Tenement and Depot Locations are shown on Figure 1.

Figure 1 Tenements and Depot Locations

Legend
M08/06 – Proposed Quarry
M08/46 – Crushing Plant
Pelias Street – Plant and Machinery maintenance
Not to scale

1.4 Proponent

The proponent is Exmouth Quarries and Concrete (ABN5311 94 1184).
Their offices are located at

24 Pelias Street,
Exmouth WA 6707
Phone 0899491049
Email exmouthquarries@bipond.com.au

The Proponent currently operates;

- Batch Plant Facility at 24 Pelias Street, Exmouth.
- Operational maintenance Facility at 24 Pelias Street.
- M08/46 Limestone Block manufacture and Crushing Plant and stockpiles.
- M08/62 Quarry operation for aggregate and construction material.

Exmouth Quarries and Concrete (EQC) are a family owned business that has been operating for 40 years in Exmouth.
The business originally commenced in earthworks progressing to development of a quarry in 1987.
EQC has a long history of working with the Shire of Exmouth to ensure its operations are compatible with local industries and residents and is in fact a major contributor to the development of the Exmouth region. The catchment area for the business comprises Exmouth, Coral Bay and surrounding localities. EQC are operating Environmental Management System to *ISO9000* Standard.

1.5 Purpose and Scope of Document

Exmouth Quarries and Concrete Mining Proposal for ALCOA Sub Lease ML 08/06 SL 3H/034 was referred to the Environmental Protection Authority (EPA) under Section 38 of the Environmental Protection Act 1986 in March 2011. The EPA decision was to formally assess the Project at: Assessment on Proponent information (Assessment No. 1874), Category A – EPA prepared scoping guideline issued (05 August 2011).
The Mining Proposal described the proposal and mitigation and protection measures in accordance with the Mining Act 1978.
Consultation concerning drafting guideline occurred with Exmouth Quarries and Concrete prior to issue of scoping guidelines on 5 August 2011 leading to the proponent 1st draft submission on 5 October 2011 ,a 2nd draft submission on 11Novemeber 2011with the Final Document submitted on 4 January 2012.
In accordance with the Environmental Protection Act 1986, this API has been prepared which describes Exmouth Quarries and Concrete Project (Alcoa Sub lease) and its likely effects on the environment.
Should approval for development be granted, the Western Australian (WA) Minister for the Environment would issue a statement under Section 45 of the Environmental Protection Act 1986 listing the management and environmental protection conditions to be applied to the proposal.
This document, which is presented as an Assessment on Proponent Information (API), gives supporting information for referral of the Project under Part IV of the *Environmental Protection Act 1986* (EP Act).
The purpose of this document is to describe the Proposal and the environment within the Quarry area to assess the potential environmental impacts; and outline management measures to mitigate these impacts.

1.6 Legislative Procedure and Requirements

Clearing Permit, works approval and licensing under Part V of the Environmental Protection Act 1986 will be sought In addition to obtaining approval from the Minister for the Environment, the Proponent will also comply with relevant environmental legislation, regulations, Australian Standards and codes of practice administered by other State and Federal Government agencies.

Environmental Legislation and Standards
Environmental Impact Assessment. Part IV
Environmental Protection (Impact of Proposals) Act 1974
Schedule 5 of the Environment Protection Act 1986
Environmental Protection Regulations
Environmental Protection Act, 1986, Part V
Environmental Protection (Unauthorised discharges) Regulations 2004
Environmental Protection (Noise) Regulations 1997
Environmental Protection Regulation 1987
Endangered Species Protection Act 1992.
Wildlife Conservation Act 1950
Conservation and Land Management Act 1984
Environmental Protection Act1986, Part V Environmental Regulation
Environmental Protection (Clearing of Native Vegetation) Regulations 2004
Bush Fires Act 1954
Soil and Land Conservation Act1945
Country Areas Water Supply Act 1947, Section 12AA
Waterways Conservation Ac t1976
Rights in Water and Irrigation Act 1914
State Planning Commission Act 1985
Mining Act 1978
Mine Safety and Inspection Act 1995
Explosives and Dangerous Goods Act 1961
Native Title Act 1993
Aboriginal Heritage Act 1972-1980(in particular Section 18)
Australian Heritage Commission Act 1975
Planning and Development Act 2006

Other DMA Legislation
Occupational Health and Safety Act 1984
Occupational Health and Safety Regulations 1996
National Model Regulations for the Control of Workplace hazardous Substances [NOHSC 105 (1994)]
National Code Practice for the Handling and Storage of Dangerous Goods 2000
Dangerous Goods Act 1998
Dangerous Goods (General) Regulations 1998

International Treaties

Convention on Wetlands of International Importance Especially as Waterfowl Habitat - (commonly known as the Ramsar Convention);

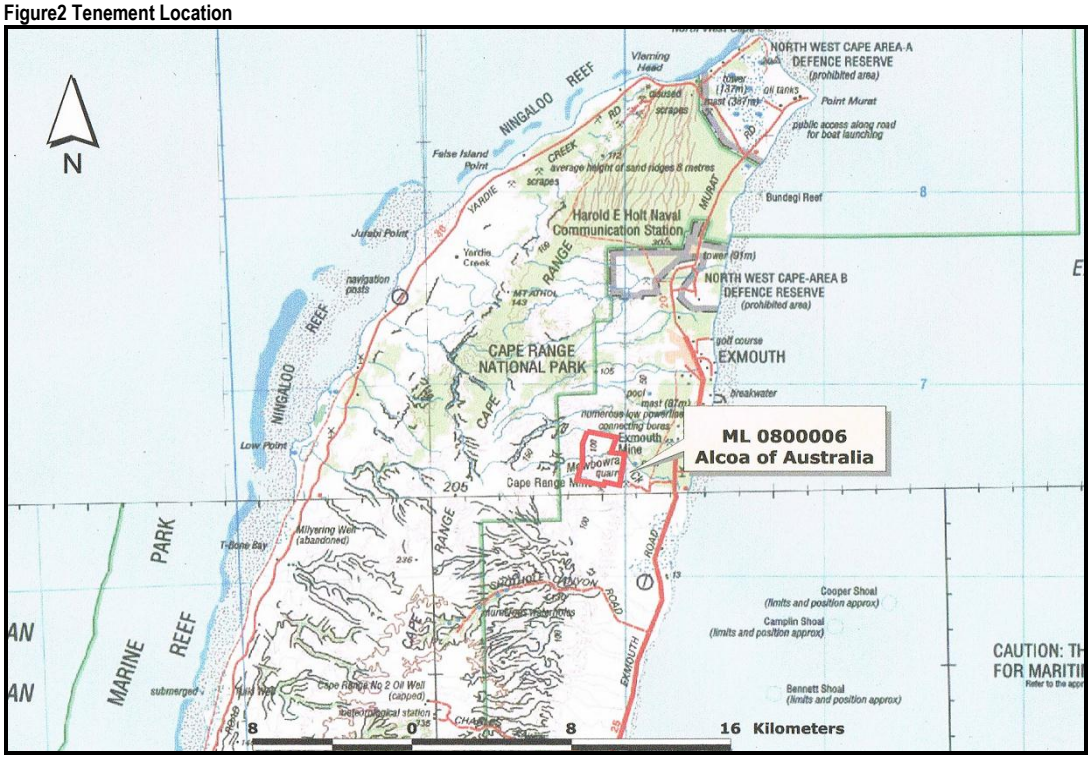
Japan-Australia Migratory Birds Agreement (JAMBA); and

China-Australia Migratory Birds Agreement (CAMBA).

2. Existing Environment

The Cape Range peninsula is a narrow protrusion of rugged limestone range projecting into the Indian Ocean at the western extent of the Australian mainland.

Figure2 Tenement Location



2.1 Physical Environment

2.1.1 Climate

The North West Cape region has a dry climate with hot summers and mild winters.
The average annual rainfall at Exmouth is 267 mm on an average of 26 days. Most rain occurs from May to July.
There is considerable variation in the climate both within the region and from year to year, this variation is considered an important factor when mitigating and managing potential impacts that may occur to flora and fauna ad significantly subterranean fauna.

2.1.2 Temperature

January is the hottest month. Learmonth has an average January maximum temperature of 38.0°C. The highest temperature recorded at Learmonth is 47.7°C on 10 February 1977.
Winters are mild with July average maximum and minimum temperatures being 24.0°C and 11.3°C respectively. The lowest temperature recorded at Learmonth is 3.8°C on 19 July 1986.

2.1.3 Rainfall and Evaporation

Much of the annual rainfall occurs either during January to March and is associated with thunderstorms and tropical lows, or from May to July when tropical cloud bands originating to the northwest often bring heavy rains. May is the wettest month with a median value of 35.7 mm on four days. The highest daily rainfall recorded at Learmonth Airport is 226.6 mm on 26 January 1971 and the highest annual rainfall is 614.7 mm in 1961. On 4 June, 2002, Exmouth received a record daily rainfall of 304.6 mm In the surrounding area, the highest daily fall occurred on 30 March 1964 when 417.8 mm The highest annual total is 832.2 mm in 1923 Cyclones can be experienced during the months from December to April but are most common in February and March (75 % of occurrences). The highest wind gust recorded at Learmonth Airport is 267 km/h on 22 March 1999 during severe tropical cyclone Vance.

2.1.4 Existing Topography

Landform of the Cape Range Peninsular is deeply dissected limestone ranges and outwash plains with extensive cave formations. The Karst system is a distinctive topography in which the landscape is shaped by the dissolving action of water on carbonate bedrock.
The project area incorporates several geomorphological units including drainage lines, dissected low stony hill and exposed limestone.
The quarry area consists of long, curved rounded plateau with thin/ or non-existent soils of calcareous clay pindan, interspersed with rocky outcrops of dissected limestone with no soil. Rocky outcrops of dissected limestone with overhang and small hollows occur. The area and face of previous and current mining activity consists of deep ripping, no soil and limited species regeneration.

2.1.5 Geology

Cape Range forms part of the Exmouth sub-basin of the Carnarvon Basin and is underlain by about 10 km of sedimentary rocks. Folded sedimentary rocks and limestone dunes form the Low ridges and peninsula.
The Range is predominantly carbonate sediments of the Palaeocene – Miocene period. The tertiary (Tulki and Trealla Limestone) of the calcareous sedimentary rocks are Karst formation and extensively eroded.
At the Quarry site, the predominant regolith is Tulki and Trealla limestone over Mandu limestone.

2.1.6 Karst Features

The subterranean habitats of the Cape Range area are of two types;
The first habitat is within the range itself, which are either dry or have perched aquifers.
The second habitat is an extensive flooded underground Karst system located on the flat coastal plain up to 2 km wide of the peninsula and extending under the foothills. This coastal fauna is aquatic and unrelated to that of the range
The Cape Range is included in a Top Ten List of Endangered Karst Ecosystems *(US Karst Waters Institute Culver, 1997*).
Investigations of coastal Karst have led to the discovery of anchialine habitat in Bundera Sinkhole. Bundera Sinkhole supports the only known occurrence of the Cape Range Remipede Community, and is located on the western side of the Cape Range peninsula.
The Mandu Limestone interface is located well below the excavation proposed; geological exposure over the proposed area is Tulki and Trealla Limestone.
It is not known what water level and water quality values should be maintained on the Cape Range peninsula to protect the majority of the Stygofauna, as the effect of changes in water levels and quality have not been completely studied for subterranean fauna.
The proposed EQC quarry has been located in consultation to the following references to determine the appropriate features that should apply to the location of the quarry site from the perspective of limiting environmental impacts to karst features:

- Cave and Karst Management in Australasia 11, proceedings of the eleventh Australasian Conference on Cave and Karst Management, 1995
- Karst Management Considerations for the Cape Range Karst Province Western Australia (*Hamilton-Smith, Kiernan, and Spate, 1998*)
- Guidelines for Cave and Karst Protection (*Watson J, Hamilton-Smith E, Gillieson D and Kieran K, 1997)*

The siting of the quarry face and direction of work has the following positive characteristics;

- Located toward the eastern margin of Cape Range where Karstic features are not as frequent as on the crest of Cape Range
- There are no caves identified as defined by the Australian Speleological Federation
- The quarry site is located in a large limestone area leaving a substantial part of the limestone undisturbed

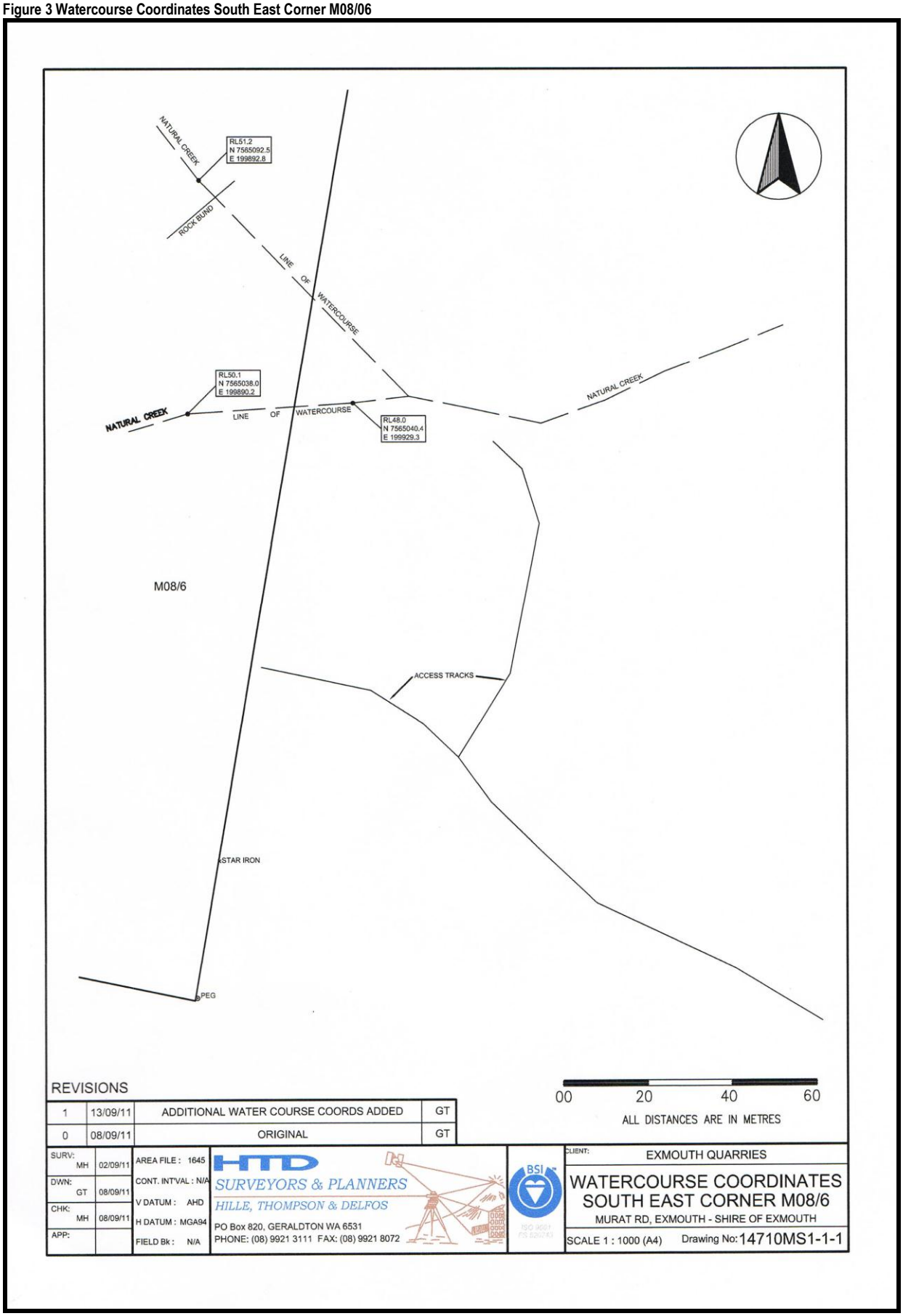
2.1.7 Soils

Exmouth Soil Province occupies about 25,100 km2 1.0% of WA *(Dept OF AGRIC*).
It is in the far western Pilbara, west of the Fortescue Province and north of the Carnarvon and Ashburton Provinces.
It correlates with the northern portion of the Carnarvon botanical district of *Beard (1990*), as well as the Carnarvon 1 IBRA sub-region of Environment Australia (2000) and the northern portion of the Carnarvon Province of *Bettenay (1983).* Exmouth Province is categorized as the soil-landscape of the Cape Giralia Coastal Zone that is based on the Giralia Anticline geomorphic province of Payne et al. (1988) and a combination of the Cape Range, Coastal Dunes, Giralia Range and (western) Winning Plains, geomorphic districts of *Payne et al. (1987).*
The soil profile in proposed quarry site located on the Cape Range landscape is Calcareous shallow loams, Red loamy earths and Stony soils.
There is limited topsoil as the proposed quarry site is dominated by Trealla outcrops with little or no topsoil, an accumulation of fine soils sub surface and within fissures has been identified.
Sampling for topsoil analysis and subsoil has doubtful justification due to minimal soil depth and volume. Soils are deeper on the base of drainage channels immediately adjacent to the quarry site. Much of this depth (20 m) is tight clay with limited ability to allow fine particles entrained in water to pass through it.

2.1.8 Surface Water

The proposed Mining area is situated within the Stony creek catchment and adjacent to the Mowbowra creek catchment.
The proposed quarry site is within the Exmouth Water Reserve and the underlying aquifer is recharged by direct infiltration of rainfall as well as infiltration of surface flows.
Within the proposed quarry area, drainage lines have formed one ephemeral creek tributary on the south east, and an ephemeral creek at the northern boundary. Permanent water bodies within the proposed quarry area do not occur. Ephemeral creek rainfall infiltration is rapid with only heavy rainfall producing creek flow. Stream flow in the creeks is intermittent and occurs during intense rainfall events generally during cyclones or storms. The impact on Stony Creek catchment is less than 1%.
Previously constructed gully and side dam at northwest end of gully has created a closed system which has affected surface flow of the Stony Creek tributary. Department of Water has issued a no requirement for Interfere with Bed and Banks (11/17/21A) permit, WRD 8953.
No quarrying is proposed within the drainage channel, and no polluting activities are proposed for the site. A survey was conducted on 13 September 2011 (*HTD Surveyors and Planners*) to assist mine planning and obtain co-ordinates and height datum and is included on the following page as Figure 3.

Figure 3 Watercourse Coordinates South East Corner M08/06



2.1.9 Groundwater

The water table lies approximately 2 -3 metres above present sea level near the coast and rises to 15m altitude towards the inland ranges.
The aquifer is recharged directly by rainfall and indirectly through the bed of ephemeral creek.
The upper part of the aquifer is Karst and has high permeability *(Water Corporation, 1996*).
Aquifer recharge is from direct infiltration of rainfall or infiltration of stream runoff where channel beds are coarse gravel, the estimated recharge for the area west of the proposed quarry and Water Corporation well field is 25 mm/year (*Colman, R. 1994).*
Groundwater is discharged from the aquifer to the ocean or springs near the coast, or by evapotranspiration and well field abstraction.
Hydraulic gradients are generally low and decrease toward the coast. (Martin *1990) estimated the hydraulic gradient to be 1.7 x 10-4.* A saline interface extends inland for about 5 km from the coast. Regional Groundwater flow near the proposed quarry is in an easterly direction from the Cape Range toward the Exmouth Gulf.
Local groundwater flow patterns may be significantly affected by karstic features and are hard to predict Groundwater pollutants may move rapidly through the aquifer and not necessarily in the direction of regional groundwater flow.
The Mandu Limestone interface is located well below the excavation proposed; geological exposure over the proposed area is Tulki and Trealla Limestone.
Drilling undertaken by mineral exploration and WAWA near the previous and proposed site has not identified elevated water tables or perched water systems within the proposed quarry site.
There is no synoptic picture available for the groundwater contribution to base flow; therefore, no compendium of this ecosystem dependence on base flow can be mapped as such.
The proposal does not include groundwater abstraction on site.

2.2 Biological Environment

2.2.1 Bio geographical Region

The Proposed quarry is located within the Carnarvon Region IBRA and within the sub region of Cape Range (CAR1), totally an area of 2,378,491 Ha. The bioregion is an area totaling 83,800 sq. km of land within Western Australia. It includes the Northwest islands, a chain of islands from Exmouth to Karratha, Islands of the Exmouth Gulf and islands within Shark Bay, including Dirk Hartog Island. This transition zone between tropical and temperate biota has resulted in diverse terrestrial and marine biological assemblages. Terrestrial habitat includes mangrove, intertidal marine, sand ridge, alluvial plain, dune field and rocky limestone range, which together support up to 300 taxa of vascular plant species, 30 mammal species, 84 reptile species, 5 amphibians and approximately 200 bird species. The limestone Karst landscape of Cape Range has density of more than 500 caves and other Karst features. The subterranean ecosystem provides habitat for 38 species from 28 families and 30 genera (10 endemic).

2.2.2 Vegetation and Flora

Botanical studies of the Cape Range area have shown there are 630 species of vascular plants, grouped into seven major vegetation communities, which have been identified by Keighery and Gibson *(1993*) within an area of 2 185 square kilometers. They cite 12 species as being endemic and a further 6 as restricted to Cape Range. Nine further taxa have been included to the DEC Priority Species list as endemic realizing a total of 21 endemic flowering taxa.
The Cape Range area contains both tropical and temperate floras at the extremes of their ranges, the 13 endemic taxa and seven others that are largely confined to the Cape Range peninsula. The region contains at least five unique minor vegetation communities confined to the limestone ranges.
According to Shepherd (2007), there is approximately 99.8% of the pre-European vegetation remaining in this bioregion.

Table 1 Percentage Vegetation Associations

	Pre-European area (ha)	Current extent (ha)	Remaining %	Conservation status	Pre-European % in IUCN Class 1-1V Reserves
IBRA Bioregion – Carnarvon	8 382 606	8 368 970	99.8	Least concern	3.62
Beard Vegetation Associations - State					
664	83 775	83 676	99.9	Least concern	41.8
Beard Vegetation Associations - Carnarvon					
664	83 739	83 676	99.9	Least concern	41.8

Approximately 1.41Ha of proposed mining face is severely degraded and previous rehabilitation has poor regeneration. Area and face of previous mining consists of deep ripping, no soil and limited species regeneration. Rehabilitation of this area has had very sparse regrowth and re-colonising. This is in stark contrast to the adjoining tenement where rehabilitation has resulted in good growth of coloniser species, with some regeneration of herbaceous plants.

Table 2 Priority or Rare Flora species potentially present within and to 5km range

Priority 2	Priority 3
Acacia alexandri	*Corchorus congener*
Acanthocarpus rupestris	
Hamelia kempeana subsp. Rhadinophylla Lepschi	
Tinospora esiangkara (F.M.Bailey) Forman	

An at desk survey Nature Map Species Report indicated the following Priority or Rare flora species potentially present within and to a 5 Km range the proposed quarry area. No species are listed in the DEC, Threatened Flora Rankings (March, 2010).
A vegetation survey was conducted on the 28 September 2006 of the proposed quarry area. The survey included opportunistic fauna observations, including assessment of scats and tracks to identify species habitation.
One Priority species was located during initial flora survey of clearing permit CPS 3622/1,
Brachychiton obtusilobus is a CALM Priority 4 Species; it is restricted to Cape Range, one tree on upper slope curve of South Summit, it is noted that this species did not appear in the Nature Map Species Report but was indicated in Bioregion search. Continuing survey is being conducted to include haul road and outer quarry zones to document and contribute data to research.
Flora survey and subsequent herbarium identification have eliminated Priority species within the immediate Proposal site, apart from one specimen of Brachychiton *obtusilobus*, *CALM Priority 4 species*, restricted to Cape Range; on the upper slope curve of the south summit. The proponent has resized the quarry area and direction of working face to prevent damage to this species.
Approximately 1.41Ha of proposed mining face is severely degraded and previous rehabilitation has poor regeneration. Area and the face of previous mining consist of deep ripping, no soil and limited species regeneration. Rehabilitation of this area has had very sparse regrowth and re-colonising. This is in stark contrast to the adjoining tenement where rehabilitation has resulted in good growth of coloniser species, with some regeneration of herbaceous plants.
The west-facing slope (Scree) of this area is poorly vegetated.
The creek flow lines of main tributary and gully have been dammed by previous mining operation rehabilitation. This man-made landscape at the Gully and Sides dam at North-West end of gully has created a closed system which has created a dam effect that has collected silt and soil to a level of 48.0RL(AHD).
The South Summit has vehicular access tracks of previous exploration activity. The vegetation is in good condition with natural regrowth and seed drift noted in grouping *Acacia bivenosa*. The North Summit to elbow contains a diverse range of habitat with vegetation condition excellent. Scree vegetation is in good condition, with particular note at South end one specimen of Brachychiton *obtulilobus*. Vegetation condition on tenement is excellent.

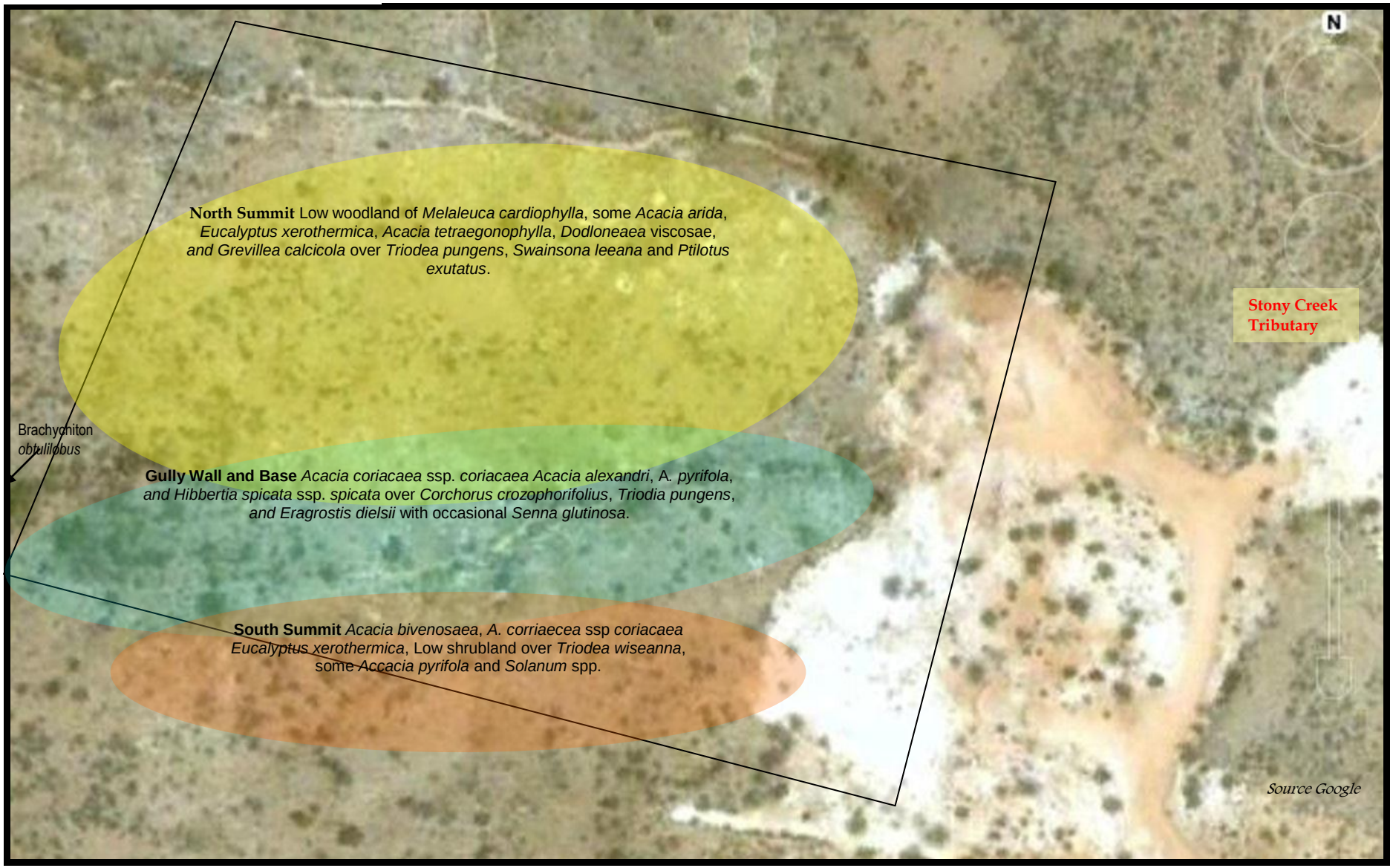
The following table contains a summary of Vegetation complex on the quarry site;

Table 3 Vegetation Complex on Quarry Site

North summit	Low woodland of *Melaleuca cardiophylla*, some *Acacia arida*, *Eucalyptus xerothermica*, *Acacia tetraegonophylla*, *Dodloneaea* viscosae, *and Grevillea calcicola* over *Triodia pungens*, *Swainsona leeana* and *Ptilotus exutatus*.
South Summit	*Acacia bivenosaea*, *A. corriaecea* ssp *coriacaea Eucalyptus xerothermica*, Low shrubland over *Triodia wiseanna*, some *Accacia pyrifola* and *Solanum* spp.
Gully Wall and Base	*Brachychiton obtulilobus*, *Acacia coriacaea* ssp. *coriacaea Acacia alexandri*, A. *pyrifola*, *Hibbertia spicata* ssp. *spicata* over *Corchorus crozophorifolius*, *Triodia pungens*, *and Eragrostis dielsii* with occasional *Senna glutinosa*.

Area and face of previous, current, and proposed quarrying site consists of deep ripping, no soil and limited species regeneration. Rehabilitation of this area has exhibited poor growth with re-colonising occurring slowly with sparse *Acacia bivenosa* and *Triodia wiseanna*.

Figure 4 Site Vegetation Complex



2.2.3 Vegetation Significance

The vegetation associations identified in the proposed quarry area are widespread throughout the Cape Range, including the Cape Range National Park are well represented in conservation reserves.
Conservation significance value for vegetation is high but the impact of the quarry area is small, this does not discount the diversity of vegetation present but in context of the diversity of vegetation within the whole landscape, the impact is negligible
EQC has committed to contain clearing to the areas specified and to keep disturbance to an absolute minimum. The maximum vegetation disturbance area will be 3.7ha.

Table 4 Flora Species

SCIENTIFIC NAME	
Annual and perennial Grasses	*Triodia pungens* *Triodia wiseana* *Cymbopogon ambiguus* *Enneapogon caerulescens*
Annual herbs and short-lived perennials	*Ptilotus rotundifolius* *Ptilotus obovatus* *Erodium cygnorum ssp cygnorum* *Stackhousia intermedia* *Euphorbia drummondii* *Convolvulus erubescens* *Stemodia ssp* *Goodenia tenuiloba* *Leschenaultia subcymosa* *Olearia dampieri ssp dampieri* *Pterocaulon sphacelatum* *Senecio magnificus* *Trichodesma zeylanicum*
Shrubs less than 3m	*Dodonaea viscosa* *Eremophila forrestii ssp capeonsis* *Eremophila freelingii* *Eremophila granitica* *Exocarpos aphyllus* *Exocarpos sparteus* *Corchorus elachophorus* *Corchorus crozophorifolius* *Senna artemisioides ssp oligophylla* *Endemic to Cape Range* *Senna glutinosa ssp glutinosa* *Amyema fitzgeraldii* *Chenopodium melanocarpum* *Acacia bivenosa* *Acacia arida* *Acacia colorata* *Acacia gregori* *Acacia alexandri* *CALM priority 3 Species* *Indigofera monophylla* *Hibiscus goldsworthii* *Hibertia spicata ssp spicata* *Melaleuca cardiophylla* *Nicotiana occidentalis ssp occidentalis* *Solanum lasiophyllum*
Trees and shrubs over 3M	*Brachychiton acuminatis* *Grevillea stenobotrya* *Grevillea calcicola* *Acacia coriacea ssp Cape Range Form* *Acacia pyrifolia* *Erythrina verspertilio* *Eucalyptus xerothermica* *Eucalyptus hamersleyana* *Eucalyptus sp "00"* *Endemic to Cape Range* *Rare Species* *Canthium latifolium*
Weed Species	*No weed species identified at quarry site.*

2.2.4 Fauna

The Wildlife Conservation (Specially Protected Fauna) Notice 2010 lists the following species and it is possible that these species occur adjacent to the proposed quarry *Petrogale lateralis hacketti (*Black –footed Rock wallaby – Warru), Troglobitic Fauna *Bamazomus subsolanus* (Eastern Cape Range Bamazomus), *Nocticola flabella* (Cape Range Blind Cockroach), and Draculoides vinei (Cape Range Draculoides) *Styglochiiropus peculiaris* is defined as within the Camerons Cave located some 10km north of the proposed site.
Regionally the Stygofauna and Troglobitic Fauna is considered to be of high Conservation value with a number of species listed in The Wildlife Conservation (Specially Protected Fauna) Notice 2010 and two community listed as Threatened Ecological Communities, Cameron's Cave, 19 km from proposed site and Bundara Sinkhole, located on the West side of Cape Range.
Vulnerable and extinct fauna species listed under the Environment Protection and Biodiversity Conservation Act 1999 that may be present in the area indicated in Table form.

Table 5 Rare and Specially Protected Fauna Species that may potentially occur in the Quarry Area

Schedule 1	Petrogale *lateralis* Black-footed Rock Wallaby
Schedule 2	Leporillus *apicalis* Lesser Stick-nest Rat Notomys *amplus* Short-tailed Hopping Mouse Notomys *longicaudatus* Long-tailed Hopping mouse
Schedule 4	Falco *peregrinus* Peregrine Falcon
Priority 4	Tyto *novaehollandiae* Masked Owl

Table 6 Vulnerable and Extinct Fauna Species Listed under the Environmental Protection and Biodiversity Conservation Act 1999

Vulnerable	Petrogale *lateralis lateralis* Black-footed Rock-wallaby Amytornis *textilis textilis* Thick-billed Grasswren
Extinct	Bettongia *leseur graii* Boodie (mainland form) Perameles *bougainville* Western Barred Bandicoot (mainland form) *Leporillus* apicalis fasciata Lesser Stick-nest Rat Notomys amplus Short-tailed Hopping Mouse Notomys *longicaudatus* Long-tailed Hopping Mouse

Table 7 Schedule and Priority Classification Definition

Classification	Definition
Schedule 1	Fauna, which are rare or likely to become extinct, are declared fauna that is in need of special protection. This schedule includes species that have experienced a significant range contraction since European settlement, have highly restricted known distributions or are species, which are poorly known, but are presumed to be under threat.
Schedule 2	Fauna, which are presumed to be extinct, are declared fauna that is in need of special protection. This includes species that are rare or otherwise in need of special protection.
Schedule 3	Birds, which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds, and birds in danger of extinction are declared fauna that is in need of special protection.
Schedule 4	Fauna that is in need of special protection for reasons other than those listed for Schedules 1-3. This includes species that are generally common, probably declining in settled regions, still well established in remote areas.
Priority 1	Taxa with few, poorly known populations on threatened lands. Taxa, which are known from few specimens or sight records from one or few localities on lands, not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 2	Taxa with few, poorly known populations on conservation lands. Taxa, which are known from few specimens or sight records from one or few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna
Priority 3	Taxa with several, poorly known populations, some on conservation lands. Taxa, which are known from few specimens or sight records from several localities some of which are one land not under immediate threat from habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 4	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could if present circumstances change. These taxa are usually represented on conservation lands.

Opportunistic fauna survey during flora surveys and subsequent site visits, seed collection, survey etc., recorded seven species of mammal (three native and 4 introduced), 14 reptile species and 37 species of birds.
The Flora/Fauna survey was first associated with the Mining Proposal document for the proposal. This document and the results of the survey were discussed with the Nature Conservation Officer, DEC to the local office for comment with regard to its adequacy. A subsequent survey was performed in August 2011 and a further in September/October 2011 to augment the original work and meet the requirements of DEC.
Mammal species of any particular note recorded during the survey was the Fat-tailed Antechinus (*Pseudantechinus macdonnellensis)*. Of note were the sightings and evidenced diggings of Tachyglossus *acculeatus* acanthion on the top of the proposed hillock to be cleared, together with the number of animals sighted and diggings noted throughout lease and adjacent to the haul roads.
Small caves were located on the Stony creek wall directly west and adjacent to the proposed site, these are noted to contain previous inhabitation by wallaby; identified by scat, it is assumed that the previous works has led to their self-relocation.
Vertebrate and bird sightings plus recording and identification of secondary signs such as tracks and scats on lease during Flora surveys indicated the current presence of the following;
Macropus robustus and *Macropus rufus* sightings and scats are noted throughout the tenement and proposed quarry site.
Reptile species seen on lease were *Pseudonaja nuchalis, Varanus tristis tristis* with burrows and diggings indicating Family *Scincidae*.
Numerous bird sightings and calls directly attend to the data collected by *Halpern Glick Maunsell (1995*).
The results of the survey were considered with respect to regional and national significance and concluded that the bird and reptile fauna are typical of the semi-arid and arid north-west and interior, many species are represented on Cape Range by populations isolated from the main part of their distributions.

Table 8 Fauna Species Identified within and adjacent to Quarry Site

Family	Scientific Name	Common Name
Macropodidae	*Macropus robustus* *Macropus rufus*	Euro Red Kangaroo
Dasyuridae	*Pseudantechinus macdonnellensis*	Fat –tailed Antechinus
Muridae	*Rattus rattus*	Black Rat
Introduced Fauna	*Oryctolagus cuniculus* *Capra hircus*	Rabbit Goat
Varanidae	*Varanus acanthurus* *Varanus tristis tristis* *Varanus gouldii*	Spiny -tailed Monitor Black-headed Monitor Gould's Monitor
Geckonidae	*Heteronotia binoei* *Gehyra variegata* *Gehyra punctata*	Binoe's Gecko Tree Dtella Spotted Dtella
Scincidae	*Morethia ruficauda exqhisita* *Morethia lineocellata*	Fire-tailed Skink Western Pale Flecked Morethia
Pygopidae	*Lialis burtonis* *Delma nasuta*	Burton's Legless Lizard Sharp snouted Delma
Agamidae	*Ctenophorus isolepis*	Central military Dragon
Elapidae	*Pseudonaja nuchalis* *Pseudechis australis*	Gwardar Mulga Snake
Bird Species		
Family	**Scientific Name**	**Common Name**
Dromaiidae	*Dromaius novaehollandiae*	Emu
Pelecanidae	*Aqhila audax*	Pelican
Accipitridae	*Hieraaetus morphnoides*	Little Eagle
Falconidae	*Falco berigora* *Falco cenchroides*	Brown Falcon Australian Kestrel
Columbidae	*Geophaps lophotes*	Crested Pigeon
Psittacidae	*Cacatua roseicapilla* *Cacatua pastinator* *Neophema elegans*	Galah Little Corella Elegant Parrot
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo -shike
Muscicapidae	*Collurcincia harmonica*	Grey Shrike-thrush
Orthonychidea	*Oreoca gutturalis*	Crested Bellbird
Maluridae	*Malurus lamberti*	Variegated Fairy Wren
Melphagidae	*Acanthagenys rufogularis* *Lichmere indistincta* *Lichenostomus keartlandi* *Lichenostomus penicillatus* *Lichenostomus virenscens*	Spiny-cheeked Honeyeater Brown honeyeater Grey-headed Honeyeater White-plumed Honeyeater Singing Honeyeater
Fringillidae	*Taeniopygia guttata* *Emblema pictum*	Zebra Finch Painted Firetail Finch
Ptilorhyncidae	*Chlamydera maculate*	Spotted Bowerbird
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird
Corvidae	*Corvus orru* *Corvus coronoides*	Torresian Crow Australian Raven

2.2.5 Fauna Habitats

The following two habitats were identified within the quarry area.

Table9 Fauna habitats identified with the quarry area

Habitat	Position	Substrate
Drainage Lines	drainage lines that pass along these areas and also penetrate into the hills	Stony creek bed and associated weathered banks derived from material associated with the adjacent range.
Rocky Ranges, Low Hills and Scree Slopes	low stony hills over scree slopes at the base of cliff faces that include hollows	rocks and fallen boulders with large areas of exposed rocks, slabs, rubble and stones

A Technical Adviser (ReJenn) who is familiar with the region, performed opportunistic surveys of the fauna of the Quarry site.
The Black-footed Rock Wallaby is listed as a *Schedule 1* species under the *WA Wildlife Conservation Act 1950*, live Black-footed Rock Wallaby were not detected however remnant habitation within small caves along the eastern wall of the northern flank of the Stony Creek tributary identified scat and previous activity. It is assumed that previous quarrying activity, i.e. blasting, have led to demise of these particular animals in the project area.
The nearby Cape Range National Park contains secure populations of this species. Advice from Nature Conservation Officer, DEC is that these animals are extensions to the known population of these animals on the Cape Range Peninsula and that the quarry should pose no significant impact to these animals.
EQC may prepare a management plan specifically monitor any populations of Black-footed Rock Wallaby if located to noted in the immediate area in consultation with the Department of Environment and Conservation.
The Wildlife Conservation (Specially Protected Fauna) Notice 2010 lists the following species and it is possible that these species occur adjacent to the proposed quarry *Petrogale lateralis hacketti (*Black –footed Rock wallaby – Warru), Troglobitic Fauna *Bamazomus subsolanus* (Eastern Cape Range Bamazomus), *Nocticola flabella* (Cape Range Blind Cockroach), and Draculoides vinei (Cape Range Draculoides).
Styglochiiropus pecularis is defined as within the Camerons Cave located some 10km north of the proposed site.
Regionally the Stygofauna and Troglobitic Fauna is considered to be of high Conservation value with a number of species listed in The Wildlife Conservation (Specially Protected Faun) Notice 2010 and two community listed as Threatened Ecological Communities, Cameron's Cave, 10 km from proposed site and Bundara Sinkhole, located on the West side of Cape Range.
Subterranean, obligate fauna comprising Stygofauna and Troglobitic fauna are documented within the Cape Range peninsular. Humphreys, *1994*, documents the extension of aquatic fauna inland, close to proposed quarry site and includes species listed under Schedule 1 of the Wildlife Conservation Act, 1950.
Data from the Extensions to Exmouth Water Supply Bore field, (*WAWA, June 1995*) suggest the occurrence of Stygofauna is below the water table and there is a likely presence of Troglobitic fauna in caves, fissures and interstitial habitats in the sub surface of the proposed quarry area.
The proposed quarry area will not be mined below the groundwater table; this will result in a low risk of direct impact on Stygofauna downstream.
No significant subterranean systems have been identified on the site or in the immediate vicinity. Blind caves and fissures may exist with the possibility of supporting Troglobitic fauna and thus have the potential to be directly impacted.
Indication is that Troglobitic fauna Species at the quarry site are far more widespread than just at the3.7ha area of the quarry site.
The 3.7ha quarry location is part of a substantial body of limestone that extends kilometres to the west/north and south and therefore is not an isolated zone. This also implicates the transfer of and travels of Troglobite species through fissures and system voids throughout the limestone.
The geology and topography of the area leads to the conclusion that the Troglobite fauna of the quarry area should have the ability to be locally transferable through fissures.
Based on site-specific assessment the Stygofauna at the quarry site was not investigated as it is considered that there is insufficient potential for the project to impact.
It is considered that there is limited potential for a species to be rendered extinct by the proposed small quarry.

2.2.6 Subterranean Fauna

The subterranean habitats of the Cape Range area are of two types;
The first habitat is within the range itself, which are either dry or have perched aquifers.
The second habitat is an extensive flooded underground Karst system located on the flat coastal plain up to 2 km wide of the peninsula and extending under the foothills. This coastal fauna is aquatic and unrelated to that of the range. Stygofauna have been identified as found primarily under the coastal plain.
Karst-dependent species include: microbiota (nanobia, fungi. bacteria, algae and other protozoa), plants, including bryophytes and a wide range of vascular plants, each of which are adapted to and require an alkaline environment, and many of which have a capacity to survive in cyclically arid conditions; and invertebrates which depend upon the Karst vegetation, or in some other way are limited to Karst terrains and vertebrates which may depend upon specific vegetation associations, or utilize the Karst terrain for shelter.
The Stygofauna of the Cape Range peninsula generally includes a number of other sympatric taxa with Tethyan disjunct distributions, such as the genera *Haptolana* (Isopoda: *Cirolanidae*), *Halosbaena* (*Thermosbaenacea), Ophisternon* (Pisces: *Synbranchiformes*) and gammarid amphipods (*Humphreys 1993a, 1993b; Barnard and Williams 1995).*
Regionally the Stygofauna and Troglobitic Fauna is considered to be of High Conservation value with a number of species listed in The Wildlife Conservation (*Specially Protected Fauna Notice 2010*)and two communities listed as Threatened Ecological Communities;
Cameron's Cave, which is 19 km north from proposed site and Bundara Sinkhole, located on the West side of Cape Range.
Styglochiiropus pecularis is defined as within the Camerons Cave. Bundera Sinkhole supports the only known occurrence of the Cape Range Remipede Community.
Surveys of Troglobitic fauna have been limited to and confined to readily accessible bores or deep caves in the northern and central plateau of the Cape Range. Locally the Troglobitic fauna are found extensively over the Range and are composed of endemic taxa. *Humphreys, 1995*, discussed that the appearance of Troglobitic fauna is within discrete zones being more highly specialised in the northern of the Cape Range and less isolated in the southern areas. Troglobitic fauna occurs interstitial and in fissures.

It is indicated through genetic evidence that separate caves are linked through fissures, this linkage contributes to the species resilience through the process of migration vertically and laterally through the Karst system.
One of the most influential factors in the definition of the proposed 5(h) reserve for limestone exploitation were studies that indicated that the deep gorges located within the northern part of Cape Range that intersect cavernous Tulki Limestone are more likely to contain speciated Troglobitic fauna (EPA 1997).
The quarry site and its surrounds have been assessed for the presence of karst features including caves (Appendix 2).
The assessment work included the following:

- A survey of the proposed location of the quarry and its surrounds
- An inspection of the quarry location and its surrounds by a qualified geologist who is experienced with limestone formations:

This assessment has found no caves at the quarry site, as defined by the Australian Speleological Federation.
An abundance of voids from millimetres in diameter to in the order of one half a metre were found throughout the limestone and the quarry location and is considered typical of weathered Trealla and Tulki limestone outcrops found elsewhere on the Cape Range and the Region.

2.3 Social Environment

2.3.1 Surrounding Land use

Land use adjacent to the haul road and mine operations includes Water Corporation Bore field and Western Power transmission line to Learmonth. The quarry site is directly to the north of ML08/46 current tenement holder is Exmouth Limestone.6 km to the east on the gulf coast is the Light Industrial area and construction of barge loading facility.

Table 10 Surrounding Land use tenure

TENURE NO./NAME	PURPOSE/NAME	MANAGED BY	ENCR AREA	ENCR PCNT
NER0018865	NER/18865,National Estate - Registered Site	Dept. of Environment, Water, Heritage and the Arts	484.57 Ha.	100.0%
FNA0009087	FNA/9087,File Notation Area	DEWHA	268.98 Ha.	55.5%
NHL0105881	NHL/105881,Ningaloo Coast National Heritage Pl	Dept. of Environment, Water, Heritage and the Arts	268.98 Ha	55.5%
EP 359 R2	PA67 Exploration Permit		237.05 Ha.	48.9%
GEP 36	PA67 Geothermal Exploration Permit		484.57 Ha	100.0%
WR 13	WATER RESERVE	Dept of Water	484.57 Ha.	100.0%
CR 34055	Water Supply	Minister for Water Resources	214.99 Ha.	44.4%
VCL	Vacant Crown Land		269.58 Ha	55.6%
MF 8	ASHBURTON M F 08		484.57 Ha.	100.0%
LGA 3360	EXMOUTH SHIRE	Shire of Exmouth	484.57 Ha.	100.0%
Land Dist. 0	LYNDON		484.57 Ha.	100.0%
WAD6161/98 Gnulli (NTC)WC97/28	YAMATJI MARLPA ABORIGINAL Native Title Claim	YAMATJI MARLPA ABORIGINAL	484.57 Ha.	100.0%

2.3.2 Cultural Heritage

North West Cape comes into the Gnulli claim area, there are three language groups represented. They are the Thalanuyji (Shire of Exmouth and a section of the Shire of Carnarvon), Baiyungu and Yiniguduara (Shire of Carnarvon) language groups.
There has been a long association between Aboriginal people and the region. Materials found in rock shelters, shell middens and caves on the Cape Range Peninsula indicate that Aboriginal people have lived on the Ningaloo coast for over 30,000 years.
Two groups of Aboriginal people lived in the area. The Junigudira occupied North West Cape and the Cape Range peninsula to a line between the bottom of Exmouth Gulf and Whaleback Hills. Baiyungu Traditional Lands began at Point Quobba and extended up Whaleback Hills and the Point Cloates area.
Aboriginal people are reported to have left the Cape Range peninsula either before or shortly after European settlement.
More recently some of the traditional people have returned to the area.
The Baiyungu Aboriginal Corporation has purchased and is managing Cardabia Station, near Coral Bay. The Ningaloo area is now spoken for by the Yamatji Land and Sea Council.

2.3.3 Socio-Economic Setting

Exmouth was gazetted in 1963 as a support town for the United State Naval Communications Station.
Exmouth is located on the north-eastern side of the North West Cape, 374 km north of Carnarvon and 1270km north of Perth.
The town was established for the single purpose of support for the operation of the Naval Communications station. The US Navy withdrew in 1993. Major employment and commercial sectors since the withdrawal have diversified into Tourism, fishing and support for the oil basin north of the Cape. The development of the Marina and Boat harbour has led an increase in building activity, as with the further release of land within the Shire. The tourism industry now generates the larger base for employment and growth.
The situation of Exmouth makes the area a popular destination with the major recreational and tourist attraction being, Cape Range National park, Ningaloo Marine Park and Fishing. Tourist numbers and the purchase of holiday homes have increased significantly over the last decade.
Commercial fishing is a long established industry in Exmouth and continues to make an important contribution to the local economy.
The increased economic benefit from the oil/gas industry with future development of the Wheatstone and Gorgon Projects is set to impact directly on the commercial, residential and economic status of the town.
The Exmouth community is dynamic with a strong focus on future development whilst mindful of the environmental and lifestyle attractions.

2.4 Site assessment Summary

Table 11 Environmental Site Assessment Summary

Hydrology	Stony Creek tributary, main feeder has bend located within Northern Boundary of lease. Previous quarry and rehabilitation have dammed feeder branch and gully in the tenement
Position in landscape	Mid-slope Valley floor
Shape of site	Rectangular, indentations or extrusions
Proximity of site to remnant of native vegetation or reserve	Nearest area of significant native vegetation is within 500 - 1000m
Corridor formation	Does not form corridor
Soils	Soil pH = no soil Soil litter depth (mm) = 0 Erosion evident Affected by past mining activity Evidence of active erosion (Gullies or rills, exposed roots) Large loose rocks
Major vegetation type	Dominant Vegetation Shrub mallee Shrubs under 1 m Grasses Herbs % Ground cover = 0 Canopy cover of dominant vegetation (per cent) 2 % Regenerating species = 6%
Presence of weeds	Weed cover = 0 Weed species = 0
Litter layer	Standing Litter layer generally absent
Salinity	No salinity in site or surrounding catchment
Hydrology	Mostly dry/Spring/seeps Stormwater drainage zones Ephemeral (intermittent)
Vegetation condition	No Tree understorey present Up to 80% of vegetation is non-existent No Ground cover present Small amount of Young vegetation present Dead trees present
Habitat Opportunities	No Trees with hollows No Logs/trees on ground No Tree falls/dead wood in waterways Rocks, caves, crevices No Clumps of reeds, grass or shrubs No Vegetation overhanging waterway No Deep waterholes No Shallow ponds No Water flow over rocks
Fire History	No evidence of fire

3. Description of Project

3.1 Introduction

The Proponent will operate the proposed limestone quarry using "best practice" with continuous improvement through an established Environmental Management System (EMS). This approach will enable better planning and management in conformance with the Environmental Protection of Cape Range Province Position Statement No. 1. (EPA1999a).
The area required for mining comprises approximately 1.41ha of previously mined rock The Proponent intends to increase the size of the mined area to a total 3.7Ha being impacted in the mining operation, this is inclusive of the previously mined area . The total area of the proposed mining activity will impact on less than 3% of the 96ha sub lease.
The proponent proposes progressively remove the previously quarried rock and restore the floor base to 50.1m AHD, then create the Laydown and process areas, the quarry face will be constructed and move progressively forward with rehabilitation occurring directly behind as the face progresses. The proponent proposes to progressively batter down the created slopes (rehabilitation) through placement of extracted material (overburden remains from previous quarrying) to create a geotechnical stable and safe final landform with a gentle to medium slope consistent with the surrounding topography

3.2 Location and Tenure

The proposed mining area is contained within Sub Lease 3H/034 of Mining Lease 08/06, Figure 5 Lease Diagram, as part of the Reserve for Limestone R5980H. CENTROID Location of M08/06SL3H/034 is: (7565087mN 199761mE).
The tenement is situated on the eastern side of Cape range, approximately 8-km southwest of Exmouth. The mine site is located behind the foothills of the Ranges, approximately 3 km from Murat Road.
The proposed quarry Local location and access Road (currently in application ML08/73) as shown on Figure 5. The use of this current access will need alleviate the construction and clearing of vegetation in an environmentally sensitive area and in respect of and commitments to environmentally sustainable operations.
Land use adjacent to the haul road and mine operations includes, MO8/145, access road to ML08/145 and the Water Corporation bore field extension.
The Exmouth bore field is directly south and east of the sublease. Approximately two-thirds of the Project site is located within the 500m wellhead protection zones of 14/97 and 10/87, as indicated in Figure 6.
There are no site buildings on the proposed site and vehicular access is in place from previous uses of the site. The access road is direct to Murat Road for transport of rock to *M08/46* for processing.
It is proposed that the trucks will enter Murat Road and travel 6Km toward town site then exit Murat Road on the left to arrive at *M08/46* this access was the initial proposed haul route for ML 08/145. Figure 7 shows location of Pelias Street Depot and Tenements.
An Industrial zone is located approximately 3.5Km from proposed area.
The Learmonth power line runs parallel to the South of the tenement. EQC is currently removing and reshaping the previously mined area.

Figure 5 Location of Access Road (M08/73)

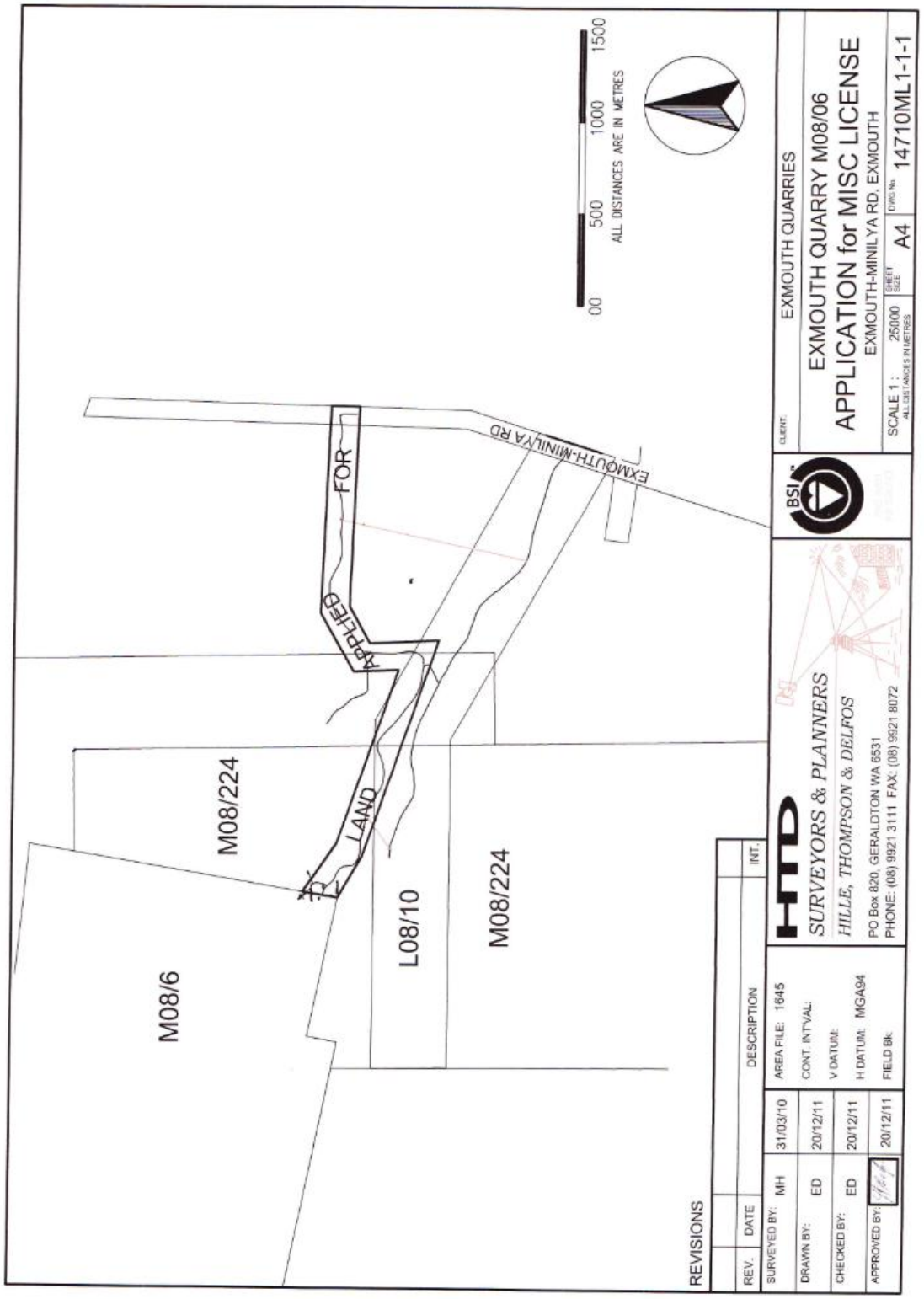


Figure 6 Sub-Lease position in regard to current Wellhead protection zones

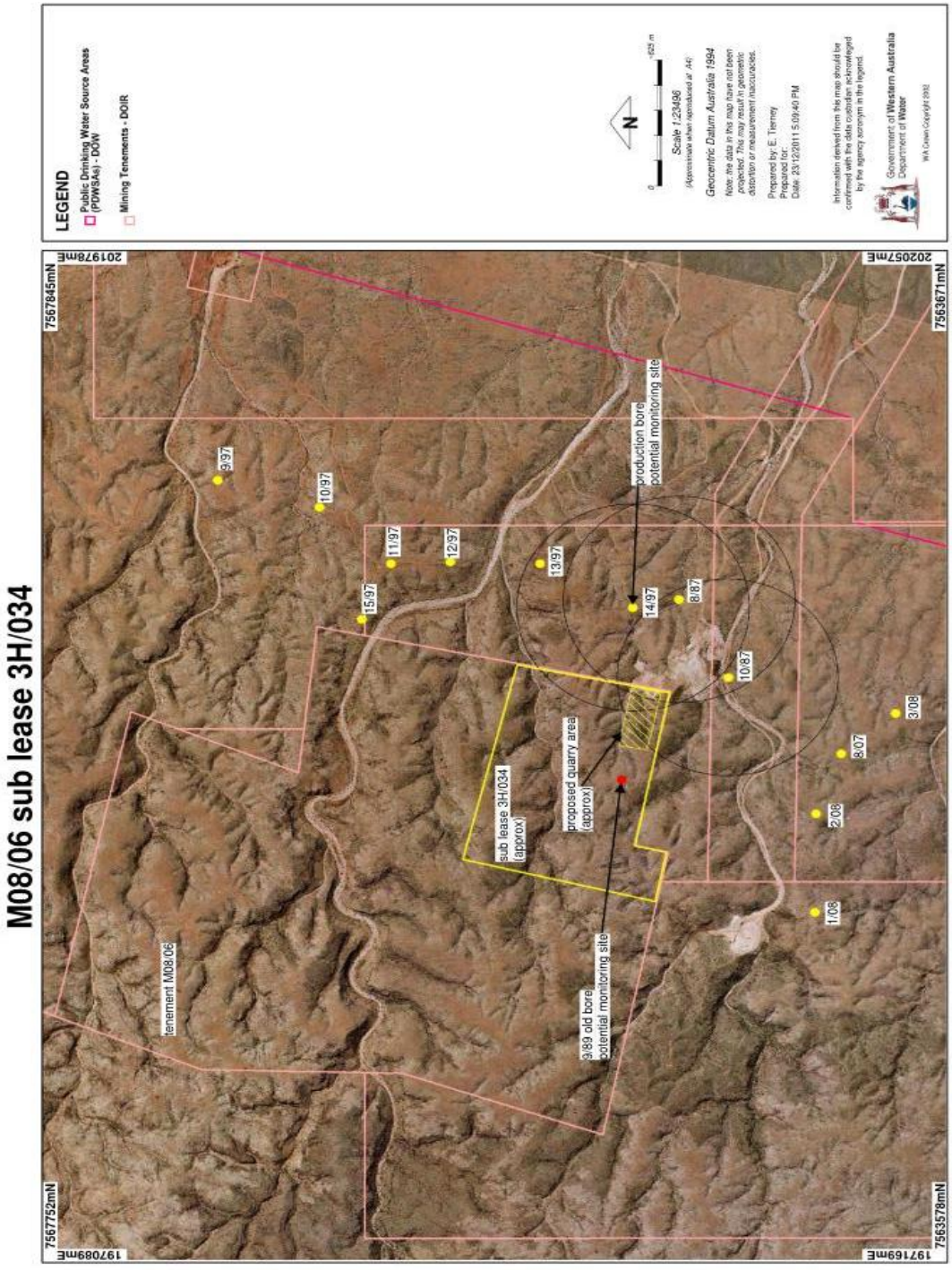
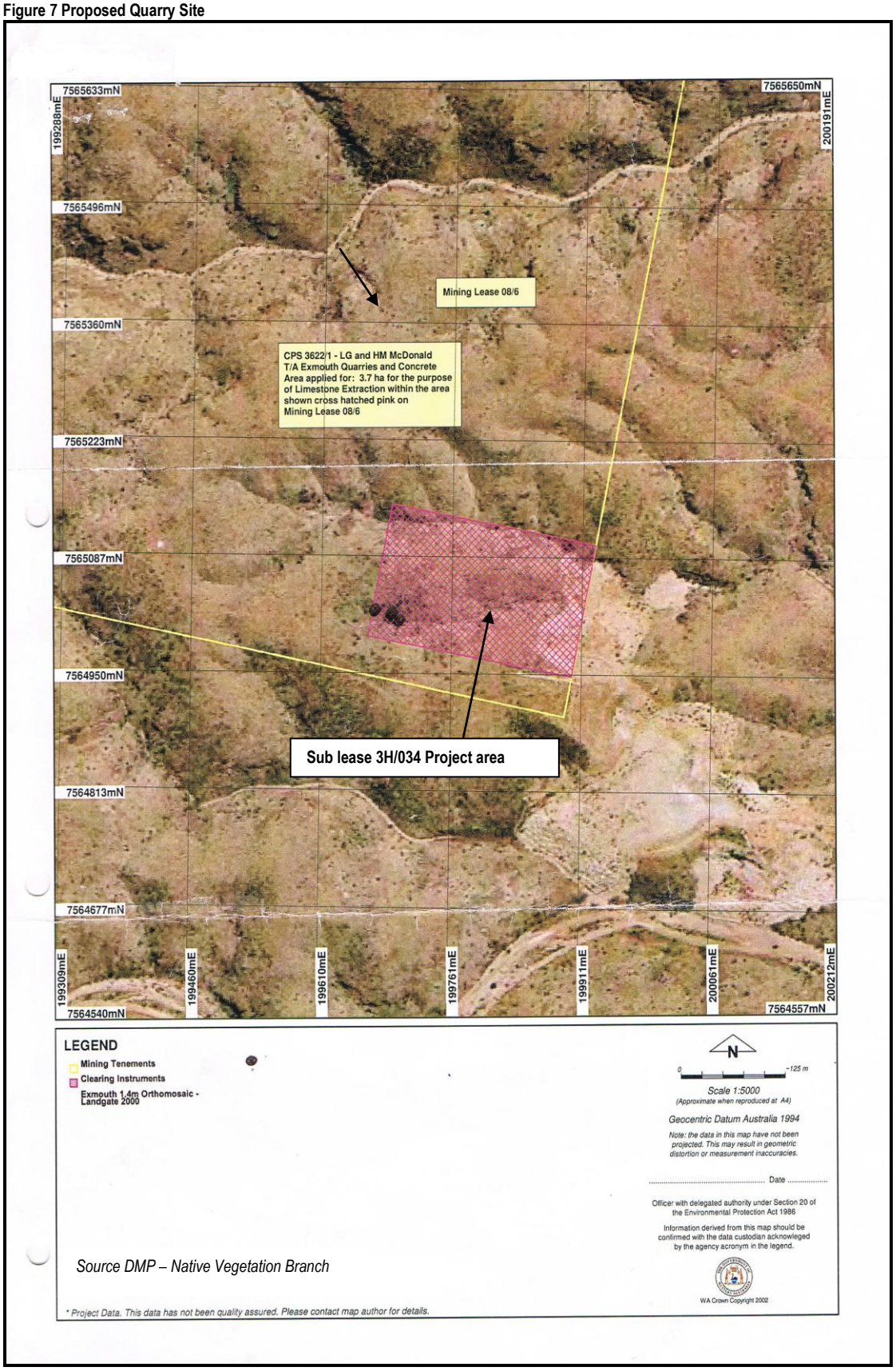


Figure 7 Proposed Quarry Site



3.3 Scale and Duration

EQC is currently sourcing previously mined rock at the site this operation has Environmental Protection Authority approval.
EQC consider the proposal to be long-term (20 Years) operation in the view of the supplying just local requirements.
Completion of project is estimated long term and the stocks within the proposed area would allow continuous operation for twenty years.
Any Further Quarry expansion and duration is directly linked to customer demand and future development that include Mining, Petroleum and Tourism industries within and near the Exmouth Region.
Expected timeframe to develop portion of required area would initiate from January 2012.

3.4 Key Project Elements

Table 12 Key Project Elements

Project Life	5 – 20 years(dictated to by demand)
Total Limestone mined	Dictated by demand
Mining Rate	*10 000* tons per year
Pit Depth	50.1 m(AHD)
Pit Area.	1.41 Ha
Face	approximately 15m
Bench Heights	6 – 8 Metres
Ore Processing	screening
Water Requirements	100 KL/day
Access Road Length	3.16km
Total Area Disturbed	3.7 Ha
Workforce (Permanent)	4
Workforce (Construction)	2
Construction Period	2 weeks

3.5 Operation of Quarry

3.5.1 Mining

The Proponent requires high quality limestone (Trealla limestone with high carbonate content) for both construction and industrial end uses. Mining will be restricted to one excavation, not below current creek bed 50.1m (AHD); relief will be restricted to above 50.1m AHD with bench heights from 6 – 8 Metres. Conventional quarrying, earthmoving and blasting will be used to operate the quarry.
The quarry will be developed using the following conventional earthmoving equipment.

- Truck (1)
- Drill (1)
- Water tanker (1)
- Loader (1)
- Excavator (1)
- Service truck (1)

An Ariel plan is shown in Figure 9 and drawn mine plan is shown in Figure 8.

3.5.2 Operation

Quarrying will start at the base of a small ridge at an elevation of 50 m AHD and will continue in a westerly direction into the small ridge. The maximum working face will be approximately 15m, with bench heights from 6 – 8 Metres. The quarry will not extend below creek bed level at 50.1RL (AHD), previous mining activity has a pit base of 48.0RL (AHD) which EQC are currently realigning. No waste material will be generated by the operation as all lower grade limestone extracted will be used, this approach will ensure the efficient use of the extracted limestone. Any unsuitable material will be utilised in the rehabilitation of the quarry. All vehicle maintenance will take place at EQC Depot on Pelias Street, Exmouth and Re-fuelling of plant will take place in bunded area on the Laydown zone of the Quarry with Drum transfer only. Future extensions to the quarry will be determined based on further resource investigations and additional environmental studies.

3.5.3 Drilling and Blasting

Drilling and blasting of the face will be done selectively on a single line and single hole firing sequence, ensuring that fragmentation is controlled and noise from the blast is kept to a minimum. Low powder factors varying from 0.2 to 0.3 kg per cubic metre (kg/m3) will be used. It is expected that 25 blasting events per year will be required.

3.5.4 Clearing and Topsoil Removal

Clearing of vegetation will only occur where it is required to facilitate the further development of the quarry, clearing will occur immediately prior to mining. Where practical, a layer of vegetation and topsoil will be salvaged from disturbed areas. Due to the relative absence of topsoil on the ridge, it will only be practical to salvage vegetation on the lower drainage areas. Topsoil and vegetation will either be removed progressively in front of the advancing quarry face immediately used in areas to be rehabilitated or will be stockpiled in shallow piles. Stockpiles will be located in the Laydown area in a specifically reserved zone for this purpose or adjacent to areas undergoing rehabilitation.

3.5.5 Processing

Processing activities proposed for the quarry are the screening of rock through a Grizzly with any further processing occurring at Processing on M08/46.
Water for quarry and processing operations will be sourced from EQC M08/46 Town Water pipe and stored on-site in an approved water tank. No groundwater extraction will be required.

3.5.6 Crushing and Screening

The quarried limestone will be screened with a Grizzly screen located at the quarry face and progressing with face. High-grade limestone will be stockpiled within the Laydown area until transport to construction site(s) or to M08/46 for further processing.

3.5.7 Access

Access to the site will be via the main Minilya–Exmouth road known as Murat Road and then along the original haul road used in the removal of rock by previous mining (Exmouth Harbour/Marina development) haul route contained within Miscellaneous Lease xxx (currently in application, see figure 5).
Unauthorised access to the quarry will be prevented by the installation of lockable gates at the entrance.

3.5.8 Product Transport

Limestone product will be transported by road in semi-trailer**.** Trucks will travel to construction site or to ML 08/46. Traffic volumes will be dependent upon project demand and thus are expected to be variable. The expected daily maximum of journeys on any one day is expected to be 10.

3.5.9 Workforce

The total permanent workforce employed on-site is expected to be a maximum of 4 personnel. All of the workforce reside in Exmouth. No recreational activities such as hunting, camping or 4WD driving will be permitted on the sublease by the workforce or by people who do not work at the quarry. This will be enforced by restricting access to the site with lockable gates at the entrance. Workers on site will be instructed during the site induction that activities such as hunting, camping or 4WD driving is not permitted and any tracks not used for specific purposes will be fenced off to prevent access. It is proposed to operate during daylight hours.

3.5.10 Hazardous Materials

Mobile refuelling for Diesel fuel is proposed at the quarry site in order to supply earthmoving machinery.
Fuel will be transported to site as required, and refuelling will take place, in a Petroleum industry standard collapsible bund.
The refuelling vehicle will then leave the site.
Any daily operational fuel and oil will be stored in accordance with Australian Standard 1940 for The Storage and Handling of Flammable and Combustible Liquids (AS 1940-1993) and within Petroleum industry standard collapsible bund.

3.5.11 Water Supply

The quarry site will utilise water sourced from town supply for dust suppression. EQC have no requirement to apply for or operate a Groundwater Bore at the site.

3.5.12 Power

A portable generator set (250 KVA) will be available if there is a requirement for a power at some time during operation. The generator will not be a fixed pant and will be highly maintained to prevent any oil leaks when in use when onsite the generator will be placed within a portable bunded area.

3.6 Operational stages

The Operational stages and the procedure for the management of Potential Environmental Impact within the proposed quarry are shown in table form following and plans for the construction of Earth Basin, Earth Bank, and Rock check are included as Appendix on CD attached to this document.

Figure 8 Mine Plan

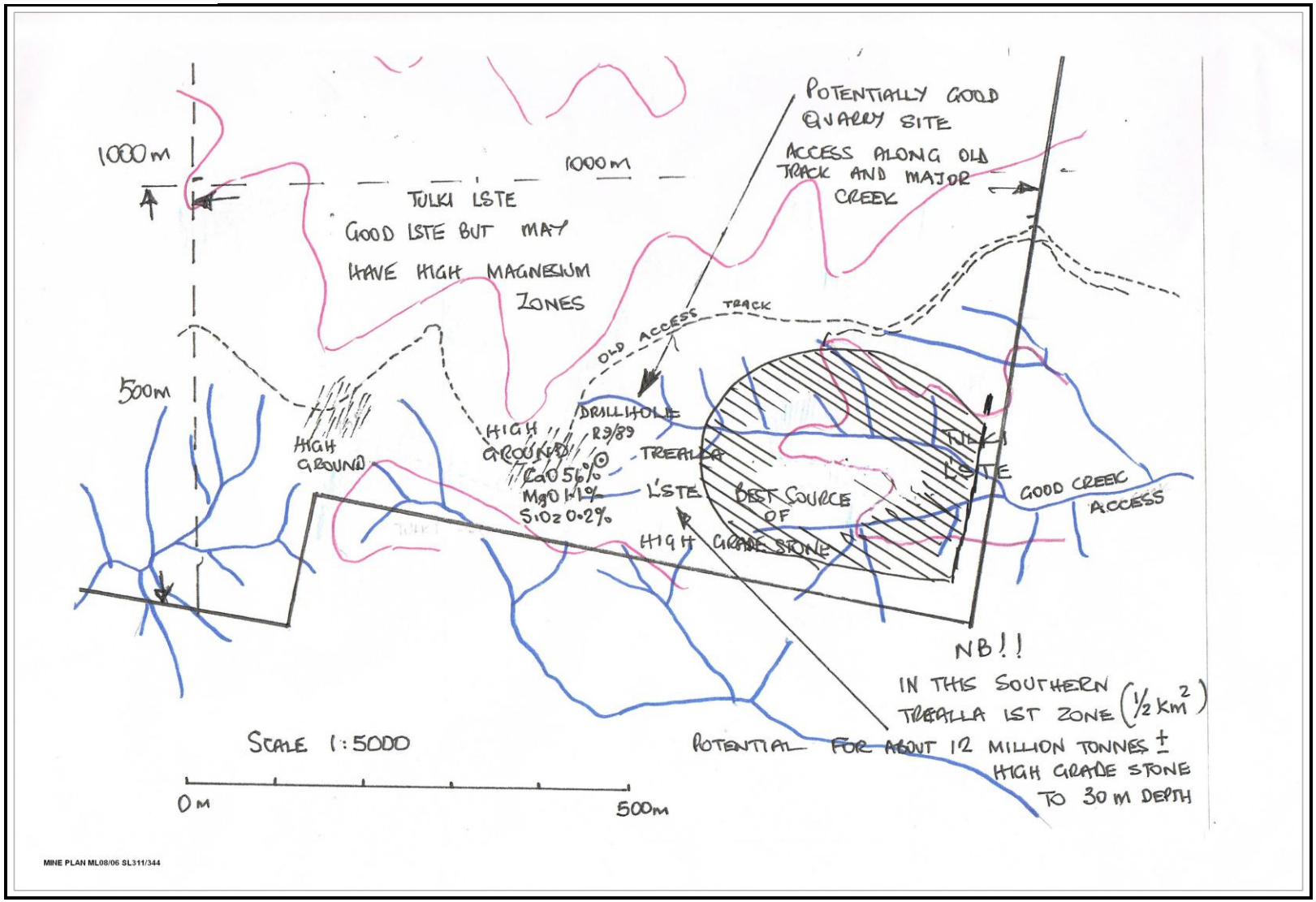


Figure 9 Aerial Site Plan

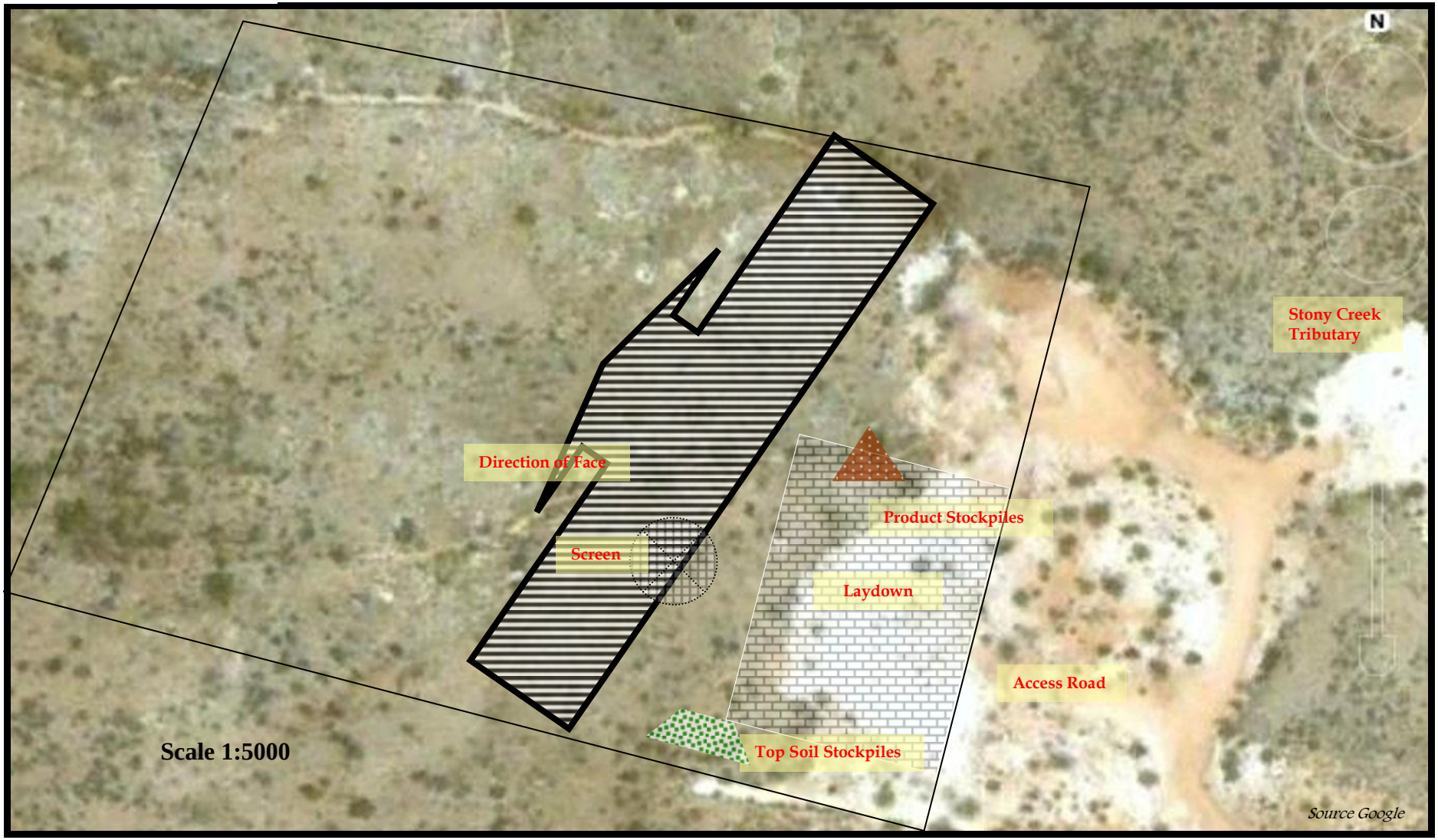


Table13 Operational Stages

<table>
<tr><th>Stage</th><th>Works</th><th>Commentary/Construction</th></tr>
<tr><td>1</td><td>Remediation works.
Restore creek flow regime of Stony creek tributary to the immediate north of the site
Construction Diversion Banks
Topsoil Stockpiling
Overburden Stockpiling
Internal Laydown
Erosion Control Works (permanent and temporary
Temporary vegetation(stockpiles)
Permanent revegetation of works
Extraction -Operation Stage one
Maintenance program
Rehabilitation of Stage one commenced</td><td>Diagrammatic plan is shown on Figure 12.
Remove dam wall on West side of tributary.
Restore previous excavation floor to 50.1 m AHD.
Place rock armour on creek bed.
Construct Earth Bank with Rip Rap.
Construct sediment basin directly behind Earth wall.
Construct earth wall with Rip Rap at old access road entry into tributary.
Construct access road with erosion control measures.
Sow all disturbed areas with the following seed mixture;
<table><tr><th>Annual and perennial Grasses</th><th>Annual herbs and short-lived perennials</th></tr><tr><td>Eragrostis dielsii
Triodia pungens
Triodia wiseana</td><td>Convolvulus erubescens
Euphorbia drummondii
Goodenia tenuiloba
Ptilotus rotundifolius
Ptilotus obovatus</td></tr></table></td></tr>
<tr><td>2</td><td>Site clearance Stage two
Diversion banks
Reshape Stage one
Topsoil removed to (stage one)
Overburden removed to(stage one)
Revegetate (Stage one)
Construct internal Laydown
Erosion ad sediment control works)permanent and temporary)
Maintenance program
Extraction operation(stage two)
Rehabilitation stage two commenced</td><td>Install pipe culverts, with headwalls, within the drainage line of Stony creek tributary crossing on the main access road.
Selectively clear vegetation, with cleared vegetation windrowed on the contour for earth bank stabilisation.</td></tr>
<tr><td>3</td><td>Site clearance
Reshape(stage two)
Topsoil removed(stage two)
Overburden removed to (stage two)
Internal Laydown and road
Erosion and sediment control works(permanent and temporary)
Revegetation (stage two)
Maintenance program
Extraction operation (stage three)
Extraction operations(stage three) complete
Reshape(stage three)
Replace overburden from (stage one)
Replace topsoil from(stage one)
Revegetate (stage three)
Rehabilitation stages one, two and three complete
Maintenance</td><td>Install diversion banks with 1m base width, 0.3m minimum depth and batter gradients to be no steeper than 1:3(V:H).
Sediment basin – settling zone volume of 1000m^3 and sediment storage zone volume of 500m^3.

Strip topsoil(if able) and overburden from stage, then stockpile and sow within 14days with following seed mixture;
<table><tr><th>Annual and perennial Grasses</th><th>Annual herbs and short-lived perennials</th></tr><tr><td>Eragrostis dielsii
Triodia pungens
Triodia wiseana</td><td>Convolvulus erubescens
Euphorbia drummondii
Goodenia tenuiloba
Ptilotus rotundifolius
Ptilotus obovatus</td></tr></table>
Clearly demarcate internal roads, Laydown and all stockpiles and protect by erosion and sediment control works.
Install surface water drainage works.
Install ridge earth bank.
At extraction stage completion, progressively reshape, re-topsoil then revegetate.
Rehabilitate completely each extraction stage before the start of the next stage.
Conduct regular inspections on all sediment control structures.
Remove sediment to overburden area.
Continue ongoing maintenance of rehabilitated areas as required.</td></tr>
</table>

Figure 10 Operational Stage 1

Figure 11 Operational Stage 2

Figure 12 Operational Stage 3

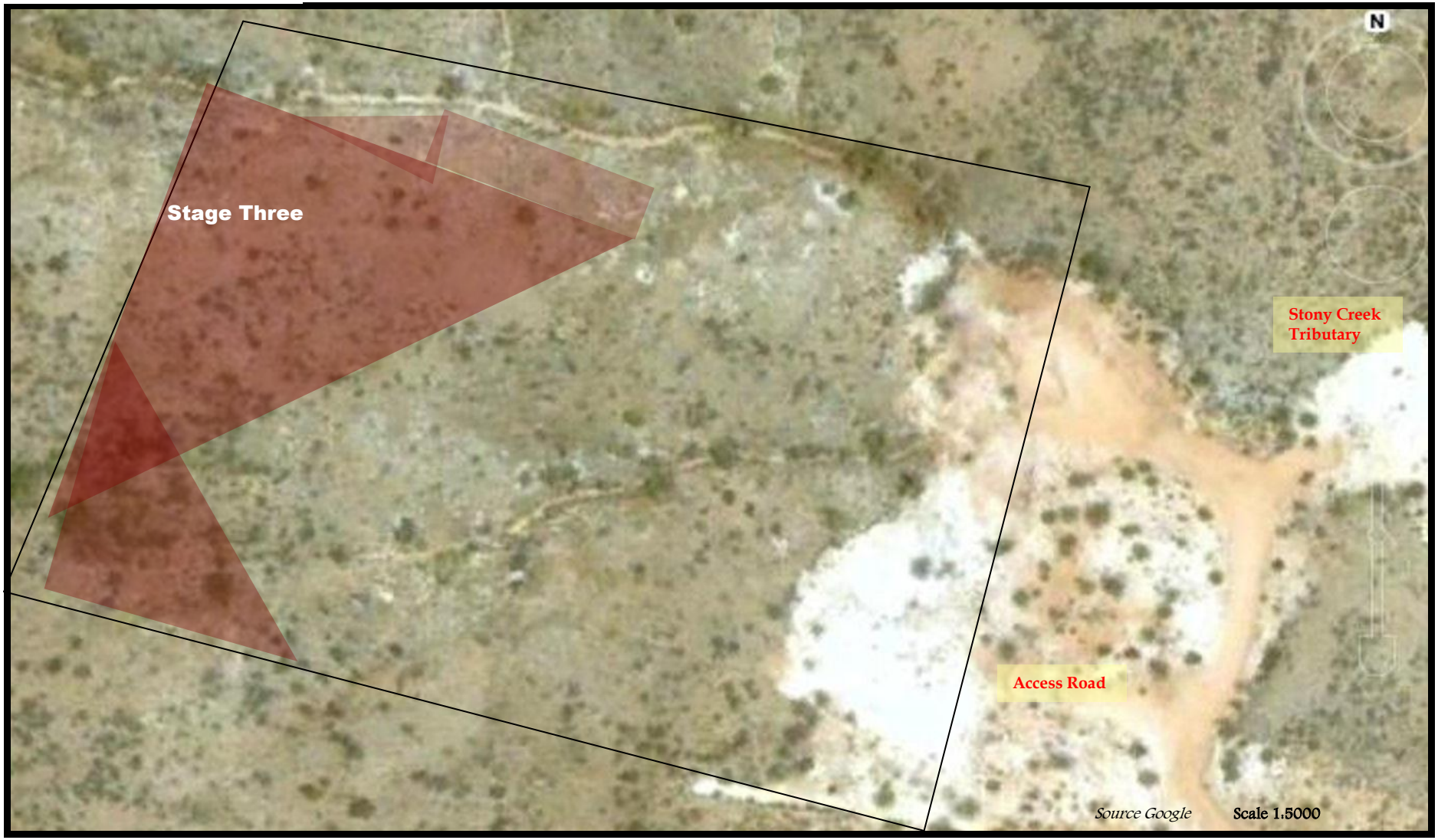
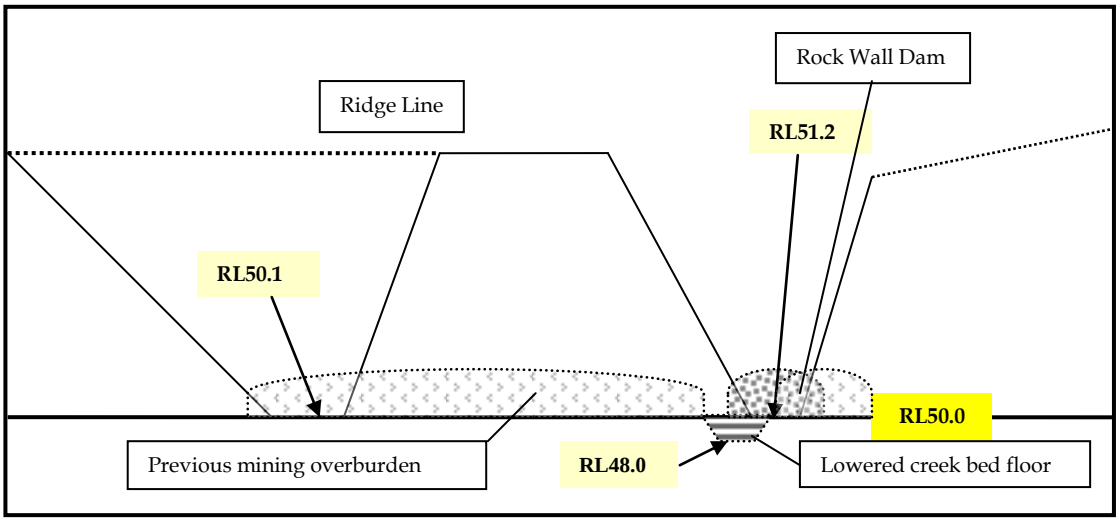
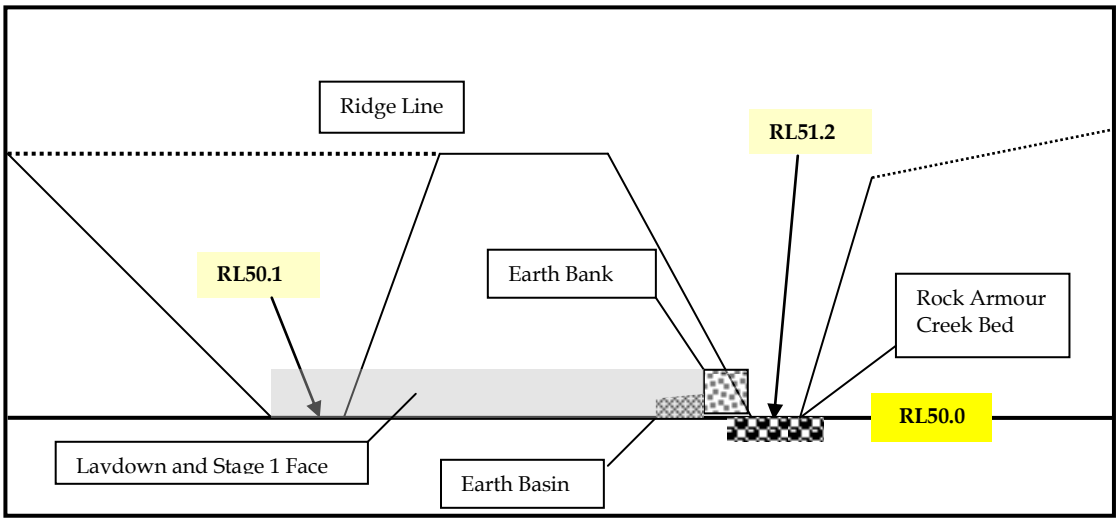


Figure 13 Cross sections Stage 1 - Schematic Remediation and Sediment Control Structures





4. Assessment of Environmental Impact and key management measures

The following surveys and investigations were conducted within the proposed quarry site of 3.7ha; the data collected was for rehabilitation data collection and is further extended to include the current Mining Proposal. Ongoing surveys are being conducted in the site and outer regions of the sub-lease to collect information only at this stage. All data collected will be entered on National databases, once collated, and verified, as all data collected on the North West Cape is of environmental heritage value it is envisioned that these surveys will continue past the quarry life.

4.1 Flora

The flora and vegetation of the Project area have been surveyed consistent with EPA Position Statement No. 3(EPA 2002b) and EPA Guidance Statement No. 51 (EPA 2004b).
An at desk survey Nature Map Species Report indicated the following Priority or Rare flora species potentially present within and to a 5 Km range the proposed quarry area;

Table 14 Priority or Rare Flora species potentially present

	Acacia alexandri
Priority 2	*Acanthocarpus rupestris*
	Harneria kempeana subsp. Rhadinophylla Lepschi
	Tinospora esiangkara (F.M.Bailey) Forman
Priority 3	*Corchorus congener*

It is noted that no species are listed in the DEC, Threatened Flora Rankings (March, 2010).
A vegetation survey was conducted on the 28 September 2006 of the proposed quarry area. The survey is attached as Appendix.
The survey was conducted in a small sample area, prioritizing the actual proposed quarry site. The survey included opportunistic fauna observations, including assessment of scats and tracks to identify species habitation.
One Priority species was located during initial flora survey of clearing permit CPS 3622/1,
Brachychiton obtusilobus is a CALM Priority 4 Species; it is restricted to Cape Range, one tree on upper slope curve of South Summit, it is noted that this species did not appear in the Nature Map Species Report but was indicated in Bioregion search.

4.2 Fauna

The terrestrial fauna of the Project area have been surveyed consistent with EPA Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002b) and EPA Guidance Statement No. 56 (EPA 2004c).
Opportunistic fauna survey during flora survey and subsequent site visits recorded seven species of mammal (3 native and 4 introduced), 14 reptile species and 37 species of birds.
Mammal species of any particular note recorded during the survey was the Fat-tailed Antechinus (*Pseudantechinus macdonnellensis).* Of note were the sightings and evidenced diggings of Tachyglossus *acculeatus acanthion* on the top of the proposed hillock to be cleared, together with the number of animals sighted and diggings noted throughout lease and adjacent to the haul roads.
Small caves were located on the Stony creek wall directly west and adjacent to the proposed site, these are noted to contain previous inhabitation by wallaby; identified by scat, it is assumed that the previous works has led to their self-relocation.
Vertebrate and bird sightings plus recording and identification of secondary signs such as tracks and scats on lease during Flora surveys indicated the current presence of the following;
Macropus robustus and *Macropus rufus* sightings and scats are noted throughout the tenement and proposed quarry site.
Reptile species seen on lease were *Pseudonaja nuchalis, Varanus tristis tristis* with burrows and diggings indicating Family *Scincidae*.
Numerous bird sightings and calls directly attend to the data collected by Halpern Glick Maunsell (1995).
The Project will not conflict with the *Wildlife Conservation Act 1950* (WC Act) as no species of terrestrial vertebrate or invertebrate fauna will cease to exist because of the Project.

4.3 Surface Caves

A fissure and cave survey was conducted across the whole site on September 16 2010 and during any site visits.
Small caves were located on the Stony creek wall directly west and adjacent to the proposed site, these are noted to contain previous inhabitation by wallaby; identified by scat, it is assumed that the previous works has led to their self-relocation.

4.4 Troglobitic Fauna

An at desk survey Nature Map Species Report indicated the following Priority or Rare Troglobitic fauna species as endemic within and to a 5 Km range the proposed quarry area with the Wildlife Conservation (*Specially Protected Fauna Notice, 2010),* listing the following species;
Bamazomus subsolanus (Eastern Cape Range Bamazomus) and *Nocticola flabella* (Cape Range Blind Cockroach).
EQC also considers the likely occurrence of the following listed species *Draculoides vinei* (Cape Range Draculoides) though not shown in Nature Map species report.
Previous Environmental surveys have been conducted for previous proposal and is indicated in the EPA Report and recommendations Bulletin 806. The various impacts on Stygofauna have been investigated as part of the Consultative Environmental Review undertaken by the Water Corporation for the extension of the Exmouth Town water supply scheme. Drilling undertaken by mineral exploration and WAWA in the vicinity of the previous and proposed site has not identified elevated water tables or perched water systems within the proposed quarry site.
Due to the small size of the area impacted and the volume of Troglobitic habitat potentially affected it is not intended to commission detailed assessment of Troglobitic occurrence.

4.5 Heritage

A Heritage Survey was conducted on 30/10/2006 with Anthropologist; Steve Corsini; Gnulli Elders/Custodians; John Dale, Ron Crowe and Nathan Clinch. Mr Sean O'Hara, Heritage Administration Officer and Jennifer Busniak, Yamatji Land and Sea Council co-ordinated the visit.
The outcome of this and desk survey revealed no evidence of cultural or heritage .significant artefacts or habitation.

4.6 Stakeholder Consultation

Table 15 Stakeholder consultations with Response to OEPA2010/000380

Date	Description of Consultation	Stakeholders	Stakeholders Comment/Issue	Proponent response/resolution
October 2010	Submission of First Mining Proposal for review	**Dept of Environment and Conservation**		
15/11/2011	Meeting		Discussion of management measures and access to potential exposed significant Karst cave exposure during operation Nature Conservation Officer expressed no reservations about the proposals considerations of exposure of significant Kars cave during operation.	Agreement of the management measures concerning Karst and groundwater protection.
23 November 2011	Site visit		Nature Conservation Officer attended site visit and concurred with the Management plan about exposure of any significant Karst cave during operation would entail short-term cessation of operation to enable scientific study of the cave.	Proponent agreement to notify local office of the DEC (Nature Conservation Officer) and cease operation for short term to enable scientific investigation of exposed significant Karst cave.
21 December 2011	Responses to OEPA2010/000380		Management plan in regard to exposure of any significant Karst cave during operation would entail short term cessation of operation to enable scientific study of the cave	Reiteration of commitment of EQC to notify local DEC office (Nature Conservation Officer) of exposure of significant Karst cave, if discovered, to allow scientific investigation.

Date	Description of Consultation	Stakeholders	Stakeholders Comment/Issue	Proponent response/resolution
October 2010-November2011		**Dept. of Water Water Corporation**	Exmouth Water Supply Protection Clearing Permit Application April 2010-, serious concerns regarding the proposal in its current form due to the risks of contamination to the water reserve, and recommended that the proposal be referred to EPA.	.
23 November 2011	Site visit		Potential groundwater contamination and remediation methods	Resultant understanding by EQC of the requirement that pollution must not occur and the resultant revising of protection and management protocols being addressed and instigated by EQC
22 December/2011	Meeting and Responses to OEPA2010/000380		Description of Water Reserve Section 2.1.8 –section should identify proposed quarry is within Exmouth Water Reserve	Section description adjusted.
	.		Section2.1.9 – to include information of local groundwater patterns. Discussion at meeting reiterated the lack of local groundwater flow knowledge by Water Corp and Dept. of Water.	There is no synoptic picture available for the groundwater contribution to base flow; therefore, no compendium of this ecosystem dependence on base flow be mapped as such.
			Previous assessment of clearing permit application April 2006, DoW advised concerns regarding proposal in the previous form.	EQC obligation to ensure no pollution incidents occurs during operation and commitment to additional training and education of EQC management and staff on the structure of Karst system and the high risk that contamination poses to the Exmouth Water Supply, including the cumulative effects of small leaks and spills. Leading to the establishment of understanding of a no spill directorial principle, emergency spill reaction training and preventative maintenance practices.
			Excavations below 50.1mAHD	Proponent articulated previous quarrying had mined to 48.0m AHD and that EQC is currently re-establishing quarry floor level to 50.1m AHD and reinstating creek flow.
			Discussions of potential groundwater impacts and proposed management What equipment will be serviced in the reserve and the management measures to be undertaken. Reassurance required for the	Servicing of Screening plant will occur on site within protected bunded areas. All machinery will have leak containment bunds placed in- situ during in-operative periods. Compliant portable bunding

			transfer of fuel and. maintenance of machinery on site.	systems are procured to ensure sealed fuel transference during refuelling and maintenance operations. This will avoid the construction of permanent bunded structures at the site.
			Storage of fuel or hazardous substances onsite.	There will be no storage of fuel or hazardous substances on the site. Any Explosive will enter and exit the site on the day of blasting. The Explosives Contractor will be required to meet environmental and safety conditions of the site.
			Design of watercourse structures for Surface Water Management. At concept, proposed water management works are in line with DoW recommendations. Proponent to submit technical drawings showing location and dimensions of the water management structures for assessment.	Proponent to supply Technical drawings to DoW of Surface flow management structures for assessment
			Location of Proposal in relation to Exmouth Water Reserve and Water Corporation Infrastructure. Supply of maps detailing accurate location of Wellheads and proximity to proposed quarry. Cooperative covenant to allow special dispensation to mine within a 400-metre precinct to specific production wellhead(s).	EQC application letter to change Tenement M08/06 conditions set in 1984, with particular relevance to; Condition 4- *No mining being carried out within 800metres of any bore*. This condition is being deliberated for specific amendment to allow mining within 400metres of wellhead zone, applicable to Sub Lease 3H/034, with request forwarded to DMP and confirmation of DoW agreement to this specific condition change.
			Discussion and planning to initiate bore sampling co-operative agreement. Actual locations of representative Bores for sampling purposes to be identified in concurrence with the revision of the Water Quality monitoring program	Water Corp to sample production bores and EQC to conduct sampling of directed non-production bores.*(See Section 6 Groundwater Monitoring*) under arrangement
			Dialogue referred to the endorsing of special consideration to adjoining Mining lease (Exmouth Limestone). Multiparty decision to recommend the assignment of identical Environmental(Ministerial) Conditions as set on adjoining Mining Lease(Exmouth	Guarantee by proponent to meet environmental management conditions (*Ministerial*) set for adjoining Mining Tenement (Exmouth Limestone).

			Limestone)	
23 December 2011			Supply of maps detailing precise location of Wellheads and proximity to proposed quarry including the potential monitoring bores surrounding the site.	
03 January 2012				Surface flow management structures technical drawings referred to DoW for assessment
04 January 2012				Portable Bunding and spill kit technical data dispatched to DoW for assessment and approval.
Ongoing consultations by email/ phone				Sampling regime and collective responsibility for actual sampling are being finalised with Water Corp and DoW.

Date	Description of Consultation	Stakeholders	Stakeholders Comment/Issue	Proponent response/resolution
October 2010	Submission of Mining Proposal	**Dept. of Mines and Petroleum Environmental Officer Environment Division - Minerals Branch**		Proponent Referral of Mining Proposal to EPA
05 August 2011	Correspondence		Per Section 41A(1) EP Act	Withdrawal of Clearing Permit application CPS 3622/1
23December 2011	Phone Meeting Responses to OEPA2010/000380		Review of the; Mining proposal in direct reference to variation of tenement M08/06 conditions set in 1984, with specific applicability to; *Condition 4- No mining being carried out within 800metres of any bore*. This condition to be deliberated for specific amendment to allow mining within 400metres of wellhead zone, applicable to Sub Lease 3H/034. DMP require submission of request to alter condition and written confirmation from DoW concerning acknowledgement of proposed amendment to the aforementioned Condition.	EQC submission letter to revise Tenement M08/06 SL3H/034 Condition 4- from *No mining being carried out within 800metres of any bore*. To allow mining within 400 metres of wellhead(s) as specified by the DoW.
			Mine Closure- Final Pit slopes? 60 degrees or 20 degrees.	Final Pit slopes are of less than 20 degrees. Battered to angle of 20 degrees or less.
			Final pit batter. Inclusion of rehabilitation pit to be capable of withstanding erosion from expected rainfall events. Rehabilitation trials and comparison to M08/62 creek bank and bed restoration.	Construction of actual slopes and benches are a composition of rock and soil interspersed, no actual topsoil, this is in line with the existing environment. Creek line rehabilitation at M08/62is in progress with a (2010) rainfall event having occurred since initial works there. Utilising same methodology is justified by the structural competence of the bank wall constructed at M08/62.Creek bed at M08/06 3H034 will not be affected and restoration of creek damaged and dammed by previous user is underway and will utilise current methods as per M08/62.
			Rehabilitation monitoring- quantitative erosion measurement	Quantitative erosion measurement will be initiated and added to KPI criteria.

04 January 2012 23 January 2012 Consultations are ongoing	Email/phone		Design of diversion bund	Storm design of bund is for a 24 hour event e.g. Cyclone. Diversion Bund Pans forwarded to DMP for assessment as part of Revised Mining Proposal. Application forwarded to DMP including request for confirmation of DoW agreement in writing to this specific condition change. Submission of Revised Mining Proposal and Mine Closure Plan.
October 2010 June 2011 09/09/2011 01/10/2011 12/12/2011	Mining Proposal submitted for comment Proponent request for discussion meeting Proponent request for discussion meeting Proponent request for discussion meeting Request for meeting, resultant phone conversation only as response to OEPA2010/000380 .	**Shire of Exmouth**	Shire has no extraction Policy or Environmental Policy No response Response as CEO will return call. No return call received. Shire request for second copy of summary to be forwarded and then meeting will be arranged. Shire assessment of API Draft 2 document resulted in comments concerning Sensitive receptors at Preston Street, conversation with Shire Planning Officer concluded that Shire assessed wrong tenement (M08/62) and has given response to that Tenement. Shire stated that there are no objections to the Proposed quarry at M08/06 SL3H/034.	Proposal is within Town Planning Scheme 2 and satisfies Town planning criteria.
30/10/2006	Cultural Heritage Survey	**Gnulli Elders/Custodians;** John Dale, Ron Crowe and Nathan Clinch. Anthropologist; Steve Corsini; Mr Sean O'Hara, Heritage Administration Officer Yamatji Land and Sea	The outcome of this and desk survey revealed no evidence of cultural or heritage significant artefacts or habitation	EQC agreement to notify Gnulli custodians if any significant sites or artefacts are revealed during operations.

Date	Description of Consultation	Stakeholders	Stakeholders Comment/Issue	Proponent response/resolution
Informal discussions		**Cape Conservation Group**		
23 November 2011	Site visit		CCG did not attend site visit with Lead Agencies.	
20 December 2011	Response OEPA2010/000380	**Cape Conservation Group and other Responders**	Water use requirement.	EQC has estimated a water use of 100kl/day due to the length of the access road and its commitment to dust control. The prevention of raising large amounts of dust is in line with the environmental obligation for the operation to have limited visual impact and the protection of surrounding vegetation from dust exposure of foliage which would endanger the viability of the vegetation
			Mitigation of the impact of the Black Footed Rock Wallaby. Request for further studies to be undertaken.	Comprehensive Previous surveys conducted by Halpern and Glick, in reference to the Exmouth Limestone operation in fact detailed no evidence of Rock Wallaby habitation prior to that original operation. The comment that Eastern side of the Cape Range populations are genetically distinct from the Western side is unfounded. This statement is supported by the discussions that have occurred with Nature Conservation Officers at the Regional DEC offices about rehabilitation of Wildlife in the local area. Attempts by the Local Wildlife CARE Group to initiate genetic studies on rescued wildlife have been curtailed by the DEC with statements that there is no foreseen genetic difference in populations. Consideration is being given by EQC to undertake Black-footed Rock Wallaby research within the whole of the Sub-lease site providing that the local Wildlife CARE Group can be involved.
			Use of potable water for dust suppression.	EQC has previously made endeavours to source untreated water for the purpose of dust suppression at ML08/062. Water Corp will supply tap heads only of treated water to the site at ML08/046. The use of saline water for this purpose is

				environmentally unacceptable. EQC will utilise any waters trapped in the Earth Basin when it is available to limit the amount of supplied water for this purpose.

4.7 Specific Consultation Sources

Table 16 Specific Consultation Sources

Required data/information	Source
Flow paths for stormwater runoff from minor (> 1 year ARI and < 10 year ARI) to major (> 10 year ARI) rainfall events.	Shire of Exmouth Water Corporation Dept of Water
Define regional drainage system within the study area.	Shire of Exmouth Water Corporation
Identify stormwater management devices	GIS to enable efficient asset management Shire of Exmouth Water Corporation NRM/Catchment Field inspection SLIP website.
Location of impervious surfaces particularly priority areas	Aerial photographs Field inspection
Management of structural stormwater devices .	Water Corporation Main Roads Western Australia
Road/pavement construction and maintenance practices scheduled major upgrading/maintenance works to identify opportunities for introduction of improved stormwater management practices	Shire of Exmouth Main Roads Western Australia Dept of Water
Management of local government premises, waste/chemical management at depots	Shire of Exmouth; Department of Environment and Conservation.
Waste management strategies, such as recycling programs and litter management.	Local government Department of Environment and Conservation
Stakeholder consultation and involvement protocols Regulation and enforcement efforts review Existing regulation and enforcement initiatives to consider their relevance to stormwater management and to gain insight into local governments and State government's capacity for implementing new initiatives that may be recommended as part of the stormwater management plan	Shire of Exmouth Department of Environment and Conservation Water Corporation Department of Water
Emergency pollution response procedures	Fire and Emergency Services Authority of WA (FESA) Shire of Exmouth; Department of Environment and Conservation Water Corporation Department of Water

4.8 Scoping of relevant factors and potential impacts

The risk assessment of factors and relevant corresponding factors, potential impact review and impact mitigation planning is shown in table form on the following pages.

Table 17 Relevant Factors, Potential Impacts and Management Factors

	Potential Impacts	Relevant Factors	Management
Vegetation	Flora loss is recognized as a major impact directly within the area of quarry. Fringing vegetation will be impacted from the effects of dust deposition from road and mining operations.	Conservation value for vegetation is high but the impact of the quarry area is small, this does not discount the diversity of vegetation present but in context of the diversity of vegetation within the whole landscape the impact is negligible EQC has committed to contain clearing to the areas specified and to keep disturbance to an absolute minimum.	Mining operations will be managed to avoid unnecessary disturbance. Preservation and storage of any topsoil located in immediate mining zone and ensuring local flora and weed, disease and pollutant free material are used in rehabilitation schemes. Introducing soil conservation, revegetation and introduced plant control programs in an integrated way across the wider landscape. EQC is undertaking pro- active revegetation program with provenance seed collection, storage and preservation before clearing and investigation/research in translocation of living species into Rehabilitation Storage areas/nursery. Current Seed viability tests are not only ensuring viability but plants generated are also being grown for direct planting. This is occurring as part of the process to restore areas in current operation. A succession plan will be developed that contains supervision, care and intervention measures to help ensure successful vegetation establishment. Care and intervention measures may include removing weeds and other plant species disturbing the desired succession pattern, fertilizing, irrigation, reseeding and other measures as appropriate. Dust suppression methods utilising water trucks to wet roads and point sources will be employed during all phases of operation.
Terrestrial Fauna	The loss of habitat is the major impact on the terrestrial fauna in the proposed quarry site. Smaller mammals and reptiles will be impacted directly. Significant displacement is expected in larger mammals and birds during blasting and operations. It is possible there will be some loss of fauna due to vehicle movement and removal of movement corridors during clearing. The impact will be localized but significant to the smaller fauna, larger fauna will relocate. No threatened fauna species are identified on the site.		All personnel operating equipment on haul road and quarry site will be inducted in obligations toward native animal welfare. Prior to clearing mini fauna will be relocated under guidance of DEC and registered Wildlife Rehabilitator. Wildlife management policy will be introduced as part of Environmental Management Plan with instruction in Wildlife first aid with assistance DEC and local Wildlife rescue group. Speed limits will apply on haul road and quarry site. Vehicular access will be limited to daylight hours with no activity at dusk or dawn. Significant wildlife crossing points/corridors will be identified and sign posted as such and drivers instructed on obligations to undertake due care and diligence. Firearms will not be permitted on quarry site or tenement. Control of introduced or problem animals and re-introducing local species, through natural attrition when their habitat requirements are met in the rehabilitated area will take place. Feral animals sighted will be reported to DEC and management strategy implemented under advice. Factors that can lead to loss of faunal habitat, for example introduction of environmental weeds will be managed. Ensuring that special fauna conservation values are considered; for examples reptile and subterranean fauna habitats will be constructed during rehabilitation process.

Factors	Potential Impacts	Relevant Factors	Management
Troglobitic Fauna	Troglobitic fauna are particularly vulnerable due to Bio geographical characteristics; they have limited geographic range and occur in small populations. Research indicates that they have enhanced sensitivity to minor changes within their chemical and physical environment. (Humphreys, *1993).* There will be direct impact on potential Troglobitic fauna in any fissures or blind caves opened during quarrying operations. Impact on the migratory process during drought or rainfall, through the fissure system is acknowledged The implication of impact on the local scale within the proposed quarry site is relative to the replication of habitat on a regional scale. The small area impacted within the quarry site in the context of Regional terms is minor and conservation significance over the larger Regional scale is negligible. Impact can be assessed as direct loss of habitat and interruption and changes to freshwater or organic inputs		The management of direct impact upon the Troglobitic fauna is difficult. Investigation by drilling to identify potential fissures and caves would have the probability of destroying habitat. Identification of these habitats and managing the operation around such locations in the small area required would limit the feasibility of the operation Operations will cease if fissures and caves are located and DEC consulted in regard to course of action
Stygofauna	Impact risk on Stygofauna from the proposed quarry operation is small as the quarry will not have any direct impact on the groundwater regional or local. Impact on groundwater from contamination is considered very low as there will be no infrastructure at the site or fuel storage. There is potential minimal impact of changes to the rainfall recharge area within the quarry to the underlying aquifer		No storage of fuels or oils will take place on the quarry site. Vehicle and plant maintenance will take place off site at the Pelias Street Depot. Refueling will take place within a lined and bunded containment area. An oil/ fuel spill contingency plan will be prepared and implemented incorporating the following; Accidental spillage of hydrocarbon based fuel, oils and hydraulic fluids or any potentially polluting fluids will be cleared immediately and contaminated soils/materials will be removed from the site to an approved (DEP) disposal location An emergency spill kit will be placed on site with sufficient equipment and absorbent material. An incident log book will be kept and DEC and Regional Water Resource officer will be notified of any incident All plant and equipment on site will be maintained in good order with all seals inspected within a scheduled timeframe to ensure clean operation
Karst System	Direct impact risk from surface disturbance indirect impact risk of the contamination of the underlying groundwater during operations. There is potential minimal impact of changes to the rainfall recharge area within the quarry to the underlying groundwater aquifer including potential impact of silting of Karst from run off of surface water from the quarry site		If a significant Karst system is identified, this is not expected as The Mandu Limestone interface is located well below the excavation proposed, the geological exposure over the proposed area is Tulki and Trealla Limestone, during operations or within the tenement area, EQC will cease operations, report the finding to DEC who will attend investigate options to conduct study of the feature. No storage of fuels or oils will take place on the quarry site Vehicle and plant maintenance will take place off site at Pelias Street Depot. Refueling will take place within a lined and bunded containment area. The potential reduction in rainfall recharge will be offset by direction of drainage to unnamed creek tributary, which is undisturbed. Surface drainage within the Quarry will be directed through an earth basin silt trap prior to discharge into undisturbed section of unnamed creek tributary, this will minimize potential silting of Karst system

Factors	Potential Impacts	Relevant Factors	Management
Groundwater Quality	There is an indirect impact risk of the contamination of the underlying groundwater aquifer during operations. There is potential minimal impact of changes to the rainfall recharge area within the quarry to the underlying groundwater aquifer	This parameter is addressed in further detail in Section 5 - Key Environmental Issues	No mining will take place within 50M of the groundwater table Sealed portable chemical toilets will be on site only during operational days. There will be no storage of fuels or oils on the quarry site. Vehicle and plant maintenance will take place off site at Pelias Street. Refueling will take place within a lined and bunded containment area. An oil/ fuel spill contingency plan will be prepared and implemented and accidental spillage of hydrocarbon based fuel, oils and hydraulic fluids or any potentially polluting fluids will be cleared immediately and contaminated soils/materials will be removed from the site to an approved (DEP) disposal location, for preparedness an emergency spill kit will be placed on site with sufficient equipment and absorbent material and An incident log book will be kept and DEC and Regional Water Resource officer will be notified of any incident All plant and equipment on site will be maintained in good order with all seals inspected within a scheduled timeframe to ensure clean operation The potential reduction in rainfall recharge will be offset by direction of drainage to the unnamed creek, which is undisturbed.
Dust	There is potential visual impact from dust during mining operations visible from coastal plain and direct impact on fringing vegetation, from dust arising from vehicular travel on haul roads, and actual mining operations		Dust generation will be managed with water suppression practices which will include regular watering of quarry floor and roads utilising sourced from town supply to prevent saline infiltration of soil structure and floral and subterranean fauna. The Screening structure is in operation on M0//62 and is fitted with dust suppression sprinkler system EQC will monitor dust emissions visibly and implement suppression strategies immediately this is indicated
Aboriginal Heritage		No archaeological or ethnographic sites known to exist within the quarry site Formal survey occurred on 30/10/2006	EQC recognizes its obligations under the Aboriginal Heritage Act 1972-1990 and will cease activities should any archeological sites be identified during mining activities and initiate discussions with the Yamatji Land and Sea Council as to the appropriate course of action

4.9 EIA Section 5 Address

4.9.1 Principles of Environmental Protection

In 2003, the EP Act was amended to include a core set of principles that are applied by the EPA in assessments (EPA 2004a). As listed in Section 4a of the EP Act, these environmental protection principles are:

- precautionary principle
- principle of intergenerational equity
- principle of the conservation of biological diversity and ecological integrity
- principles relating to improved valuation, pricing and incentive mechanisms
- principles of waste minimisation

Exmouth Quarries and Concrete have considered these principles in its assessment of the environmental impacts associated with the Revised Proposal (Table18).

Table 18 EIA Section 5 Address

Principle	Consideration Given In Proposal	Section Addressed in PER
1. Precautionary Principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation In the application of the precautionary principle, decisions should be guided by: **a.** careful evaluation to avoid, where practicable, serious or irreversible damage to the environment **b.** an assessment of the risk-weighted consequences of various options	A risk assessment process has been adopted in the development of this project with the intention of identifying issues early in the process to enable planning for avoidance and/or mitigation Part of this process includes undertaking detailed site investigation of the biological and physical environs. Where these investigations identify significant environmental issues, project design was modified to avoid or reduce potential impacts, where reasonably practicable A number of management plans are prepared and being implemented to manage potential effects on terrestrial, subterranean and marine flora and fauna, as relevant	Refer to risk-based assessment approach outlined in Section 4.0 and detailed assessment of factors in API Sections 5.0 through to 8.0.
2. Intergenerational Equity The present generation should ensure that the health, diversity and productivity of the Environment is maintained or enhanced for the benefit of future generations	Exmouth Quarries and Concrete are committed to meeting the sustainability principles. Integration of these sustainability principles ensures the environment in which Exmouth Quarries and Concrete operate is maintained and, where possible, enhanced for future generations	Refer to API Section 8.0
3. Conservation of Biological Diversity and Ecological Integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration	Conservation of biological diversity and ecological integrity is a major consideration Biological investigations were undertaken to provide sufficient local and regional information to assess the environmental significance of the Proposal A number of management plans are prepared and implemented to manage potential effects on terrestrial, subterranean fauna, as relevant	Refer to API Sections 2.0 and 4.0
4. Improved Valuation, Pricing and Incentive Mechanisms	Not applicable	Not applicable
5. Waste Minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment	A number of waste minimisation measures are planned to be implemented, including implementing the principles of reduce, reuse and recycle in relation to solid and liquid waste management	Refer to API Section 3.0, and 8.0

4.9.2 Environmental Management Plans

Management plans are required to be prepared

♦ Environmental Impact Report
♦ Project Site Rehabilitation Plan
♦ Decommissioning and Closure Plan

Exmouth Quarries and Concrete believe that the implementation of conditions consistent with those prescribed for the Quarry, when applied in conjunction with current regulation, will effectively manage all environmental aspects of the Proposal (Section 15.5).

5. Protection of the Exmouth Water Supply

5.1 Principal Objectives of protection of the Exmouth Water Supply

The principal objectives of the Management of Protection of the Exmouth Water supply are set out below;

- To minimise erosion and sedimentation from active and rehabilitated areas, thereby minimising sediment ingress into the surrounding catchment
- To minimise the volume of water discharged from the project site but, should the discharge of water occur(intense rainfall event, ensure sufficient settlement time is provided prior to discharge so that suspended sediment within the water meets the objectives in the point above
- To manage surface flows upstream of the project site that rehabilitation and limestone quarry activity are not affected by flooding
- To minimise erosion of the ephemeral watercourses that traverses the site
- To monitor the effectiveness of surface water and sediment controls and to ensure all relevant water quality criteria are met
- To prevent groundwater contamination and the protection of the Water Corporation infrastructure from hydrocarbon spills.

The principal design aspect for the project is the prevention of 'clean' water in the naturally occurring ephemeral drainage entering the operational disturbance area. This will be achieved using cut-off drains as well as the containment of dirty water in a sediment control structure within the operational area of the project to eliminate any uncontrolled runoff. Each ephemeral watercourse will be restored and water redirected into the natural channel once rehabilitation of the disturbed area is satisfactorily stable.

Principle EPA Objectives:

Provision and management of water should be according to the following:

(a) To ensure a high standard of water management, abstraction of all water for all uses should be coordinated, managed and monitored by a single agent who has day-to-day production and monitoring responsibilities and is located in the Exmouth area (currently the provider for Exmouth water supply is the Water Corporation). This responsibility for coordinated management should include industrial and domestic bores as well as those at the Harold E Holt base where salinisation of the freshwater lens has already occurred some years ago. If the deep saline aquifer not yet exploited is to be developed, it should also come under the day-to-day artesian/sub-artesian management of the single provider.

(b) Unless monitoring indicates that production of water should be reduced, the current Water Corporation Borefield (including existing bores and the approved extensions) combined with bores from other users of shallow groundwater should be taken as the total amount of water available for development in the Cape Range Province. This forms a key to limiting human carrying capacity to sustainable levels.

(c) To manage water abstraction to ensure that karst formations and wetlands are protected, all bores in the area should be licensed and abstraction from all bores should be coordinated through a single provider with day-to-day management responsibility. As the major abstracter in the area, an on-site presence and good monitoring systems, the Water Corporation should be the current focus for this coordinated management.

(d) Total water use on the Cape Range Peninsula should be constrained and maximum recovery and reuse should be implemented with sufficient treatment to reduce nutrient and pollutants loads to levels adequate to protect karst systems. Total water cycle includes water supply for all purposes (environmental, domestic, industrial, irrigation), water collection, treatment and disposal.

(e) Activities with the potential to produce elevated nutrients or pollutants in water should be carefully designed, sited and managed. Nutrient losses to karst systems should be prevented and activities requiring application of large amounts of nutrients, such as horticulture, should be avoided. Treatment should be implemented to minimise nutrients and pollutants prior to any secondary use affecting karst.

5.2 Location

The proposed quarry is located in the water catchment of Stony Creek and the Exmouth Water Reserve and the Exmouth Central Subarea Bore field. The Bore field is located to the west and south of the township and extends approximately 7kms along the eastern flank of the Cape Range. Exmouth's water supply is sourced from this Bore field. The Water Reserve is managed as Priority (P1) area.

Table 19 Exmouth Water Supply Bore field Summary

Local Government Authority	Shire of Exmouth
Locations supplied	Town of Exmouth
Source Description	Managed P1 area 500M Wellhead zones for each production Bore
Numbers of Bores	34 Production Bores 22 Observation Bores
Publication of drinking water source protection plans(DWSPP)	December 2000, *Exmouth Water Reserve, water source protection plan* June 2011, Exmouth Water Reserve, *drinking water source protections review*
Proclamation status	Gazetted in 2002 *Country Areas Water Supply Act 1947(WA)*

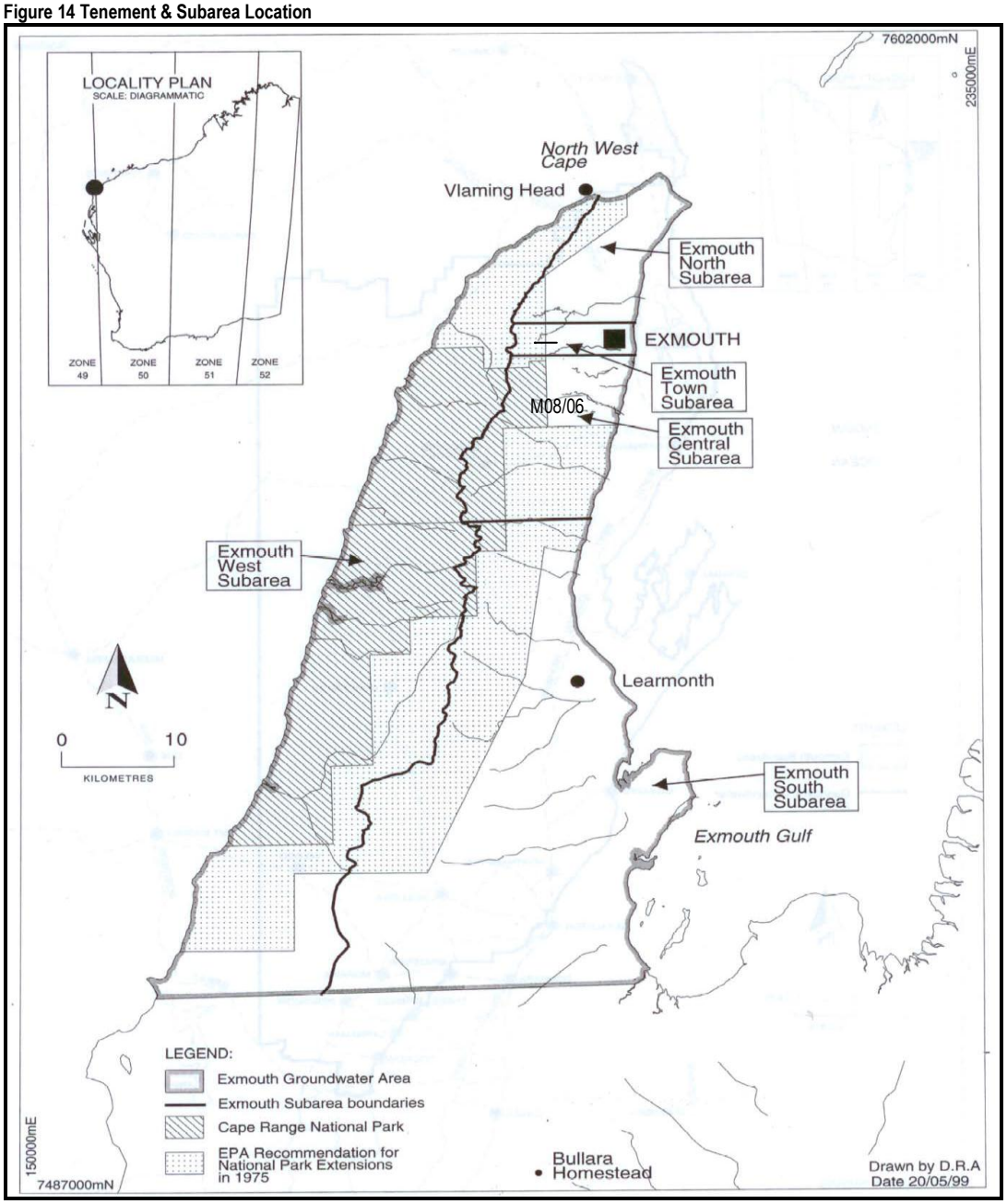
5.3 Site Characteristics

Table20 Site Characteristics

Groundwater Aquifer	The aquifer supplying the Bore field is located within the Mandu Limestone Formation, which contains an unconfined aquifer of a Karstic nature. The recharge area for the Exmouth Town Water Supply Reserve consist of the area overlying the well field itself and the up gradient area to the west, which roughly aligns with the axis of a groundwater divide.
Groundwater Aquifer Depth	Depth to groundwater beneath the proposed quarry floor was assumed to be approximately 50 m; In unconfined aquifers (i.e. surficial and fractured rock aquifers such as the proposed quarry site); the depth to the top of the aquifer was assumed to be the water table level. This and the depth and thickness were obtained by reference to relevant reports and bore records,however Water Corporation observation Bore 8/08 located 800m east from the quarry site has level of 85.55 mbotc (Meters below Top of Casing). Groundwater levels are highly responsive to rainfall with Water Corp data indicating Production Bore (14/97) reached approximately 2.5m AHD following heavy rainfall in 2008.
Surface Water	Quarry is situated within the Stony creek catchment and adjacent to the Mowbowra creek catchment. The proposed area contains one closed gully on the south east, and creek tributary, at the bend located within the northern boundary of the proposed mining area. Permanent water bodies within the proposed area do not occur. Ephemeral creek rainfall infiltration is rapid with only heavy rainfall producing creek flow. The impact on Stony Creek catchment is less than 1%.*

**Previous quarry and rehabilitation have dammed the feeder branch and gully in the tenement. Department of Water has issued a no requirement for 11/17/21A permit, WRD 8953.*

Figure 14 Tenement & Subarea Location



ML08/06 Tenement & Subarea Location

Source WRC 1999

Overview of the typical rainfall, flow, sediment and planform characteristics associated with the regional location of the proposed Quarry.

Table 21 Overview of the rainfall, sediment and planform characteristics

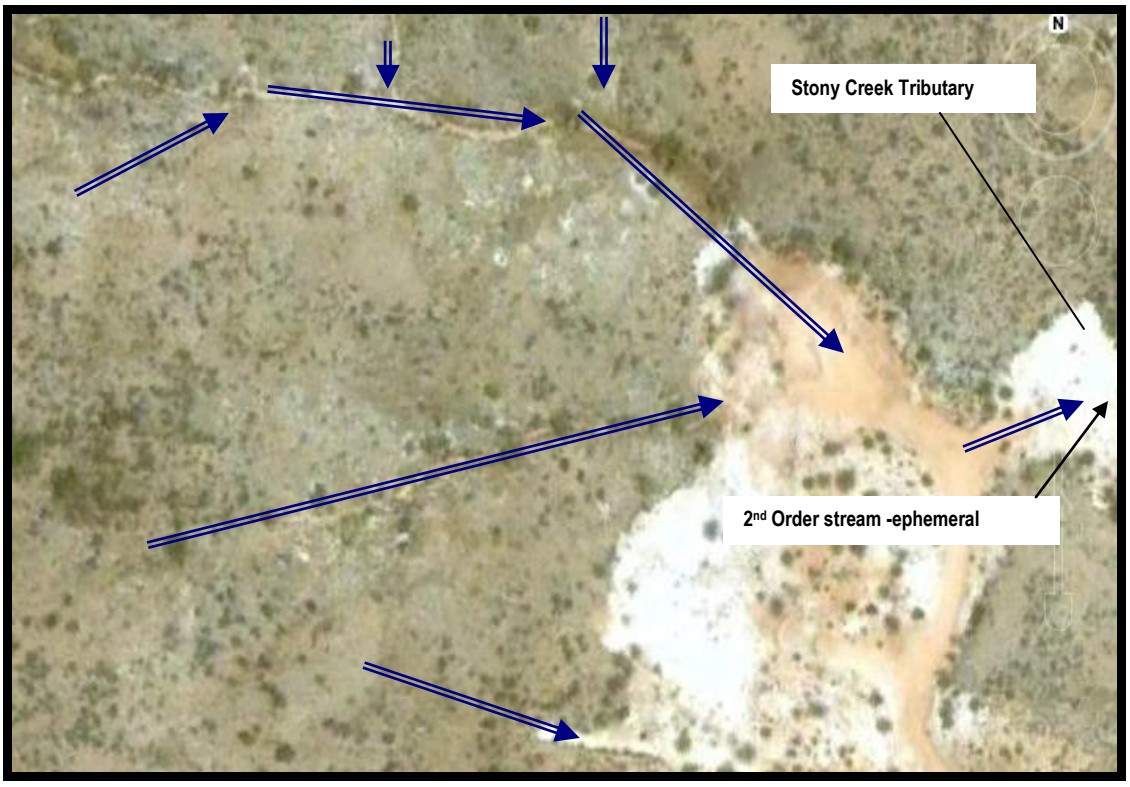
Landscape unit	Landscape characteristics	Rainfall and flow regime	Sediment type	Typical planform characteristics
Pilbara Craton	Steep to low slopes narrow gorges with in upland rocky beds areas.	Episodic flood events due to dissipating cyclones.	Moderate sediment loads Range of sizes available including cobbles	Bedrock and fault controlled (straight) or broad braided sand dominated channels.

Source WRC

5.4 Surface hydrology

The proposed Mining area is situated within the Stony creek catchment and adjacent to the Mowbowra creek catchment.
Within the proposed quarry, area drainage lines have formed two 2nd order ephemeral creeks, one within the gully that forms part of the quarrying zone, on the south east, two 2nd order ephemeral creeks on the northern bank of the main ephemeral creek at the eastern boundary. Permanent water bodies within the proposed quarry area do not occur. Ephemeral creek rainfall infiltration is rapid with only heavy rainfall producing creek flow. Stream flow in the creeks is intermittent and occurs during intense rainfall events generally during cyclones or storms.

Figure15 Natural Surface Water Flows



5.5 Groundwater Quality Risks

There is potential for contamination from the quarry site as the water for Exmouth is drawn from an unconfined aquifer which has a Karstic nature, features within the karst, solution channels, provide conduits for the rapid transportation of any contaminates into the aquifer. Identification and prediction of contaminates movement is made difficult by the karst formations.

5.5.1 Potential Water Quality Risks

Table 22 Potential Water Quality Risks

Activity	Description of Risk
Clearing of Native Vegetation	Loss of vegetation buffers and reduced potential for filtering contaminants. Increased erosion and sedimentation which may bock recharge pathways and cause increased turbidity
Vehicle and machinery use	Spills while refuelling; leaks and oil or other contaminants during operation or servicing
Construction	Vegetation loss; leading to increased erosion and sedimentation
Road and Laydown runoff	Atmospheric and vehicular deposition Turbidity from mining operations
Surface runoff flow modification	Changes to runoff characteristics due to constructed impervious surfaces Changes to surface water flows and recharge pathways Potential for increased flooding and erosion if poorly constructed
Increased human presence	Generation of waste Increase risk of prohibited items being bought into reserve or of illegal activities occurring Microbiological contamination of groundwater by human effluent
Blasting	Sedimentation
Restoration activities	Herbicides used for weed control, baits and carcasses associated with feral animal control and fertilisers used in revegetation programs have the potential to contaminate groundwater

5.6 Erosion and Sediment Control

5.6.1 Land Disturbance

All erosion and sediment controls will be implemented in advance of clearing and stripping operations, including the installation of earth banks around the perimeter of the working area, see Site Plan – drainage.
Land disturbance will be minimised by clearing the smallest practical area of land ahead of limestone quarry activities and leaving this area disturbed for the shortest possible time. This will be achieved by restricting areas to be cleared of vegetation to the areas directly up slope of the working face and programming the works so that only the area sufficient for ensuing three to four months of operation will be cleared therefore limiting the time that areas are exposed and limiting the potential for erosion and sedimentation.

5.6.2 Topsoil Management

Topsoil stripping, though limited, as far as is practicable, will be undertaken when the soil is in a slightly damp condition thus reducing damage to soil structure. Stripped soil will be transferred to completed sections of final landform for immediate spreading if operational sequences, equipment scheduling and weather conditions permit. When this is not the case, topsoil will be transferred to stockpiles within the existing areas of disturbance, or at the perimeter of proposed rehabilitant activities. If longer term stockpiling is required, a maximum stockpile height of two meters and a batter slope of 2:1 will be maintained to preserve biological viability and reduce soil deterioration. Stockpile will be placed in an area to avoid impediment of natural drainage lines and minimise the likelihood of water ponding against the stockpile (see Figure 15 Site Plan).

5.6.3 Diversion Works

Up slope water, flows in the two 2nd order ephemeral streams will be diverted from the working face and Laydown area through the construction of earth banks around the perimeter at the ridge height. In this way, clean water will be prevented from entering the active disturbance.
This is indicated in the Figure 15 Site Layout Drainage.

5.6.4 In Pit Water Management

All dirty water will be contained within the disturbed area of the proposed quarry and directed to internal erosion controls prior to discharge. This Earth Basin will operate as a containment bund to ensure uncontrolled water is not discharged from the working area.
The Laydown area and the working areas behind the face will be graded to direct the 'dirty' water to the Earth Basin for settlement.
Water from the internal settlement (Earth) basin will be used for dust suppression purposes, which will assist in maintaining water–capture capacity within the basin.

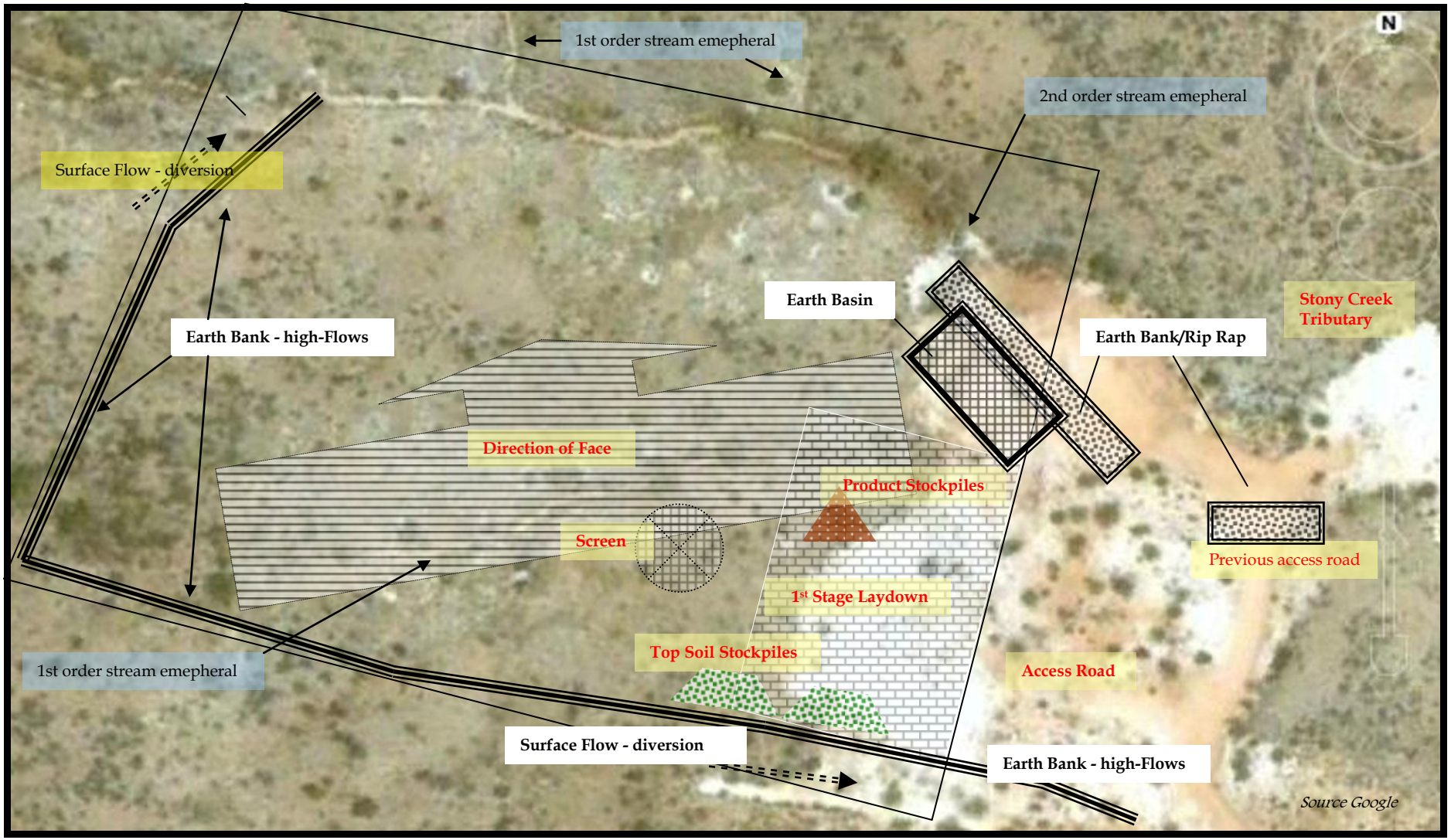
5.6.5 Rehabilitation of Creeks

Once quarrying has been completed, the land surface will be constructed in accordance with the proposed final landform levels and progressively rehabilitated. At this time, the natural creek tributaries within the area will be reinstated to the original position. Once the surface of the creek and surrounding area is relatively, stable the Earth Basin will be removed and a channel created through the flow control earth bank to re-instate flow into Stony creek tributary at its original point. Creeks will be restored with controls to minimise erosion within the restored sections, and controls to mitigate erosion upstream or downstream. Rock lined channels will be constructed to form channel surfaces.

5.6.6 Previous Quarrying and Rehabilitation

Because of previous operations the existing Stony, creek tributary is in a disturbed condition with damming of Stony Creek tributary, having occurred and a lowering of creek bed floor, Figure 9. Remediation of these disturbances will occur, as a pre operational activity (Stage 1) .This will return creek flow regime to prevent pooling as has been occurring both upstream of the dam wall and downstream. The area will be protected with earth bank and Rip Rap to restore natural flow regime and protect bank fall, Figure 15.

Figure 16 Site Drainage Plan
Stream order determined by number of tributaries (Strahler 1953)



5.7 Key design Elements

Table 23 Key Design Elements

Channels	Designed to convey the 100ARI storm event Generally trapezoidal in shape with 3:1(HV) bank batters and a base width of two metres The overall width of each channel will be at least 2 meters for the 2nd order ephemeral creeks Will be rock lined riprap constructed in accordance with WQPN6, DoW and this publication including the placement of adequately sized rocks to a height of 2 metres Soil will be packed between rocks to allow establishment of herbs and grasses for long term channel stabilisation
Alignment	The natural curves and will be used to reflect natural creek characteristics
Riparian corridor	Will be established with a minimum of 10 metres, measured horizontally and at right angles to the flow from the top of the creeks(both banks)

5.8 Maintenance

The quarry manager will undertake regular environmental inspections to ensure that Water Management controls are functioning as required. Regular inspections will also occur of Earth Banks and Earth Basin after run off events, to check for scouring and sediment accumulation.

Table 24 Structure Maintenance Regime

Parameter	Action	Remediation
Controls	Regular environmental inspections	Surface restored to meet required standards
Haul Roads	Visually inspected to ensure mitigation measures are functioning to convey surface flows from road and Laydown areas without causing erosion	Additional controls constructed if indicted
Sediment Basin	Regular inspections, visually, ensuring that there is no sediment builds up or water discoloration	Design review and restoration
Restored creek channels	Regular inspections to ensure conveyance of flow Visual check for early signs of erosion at banks and points of discharge	Construction of additional erosion controls, including vegetation cover, armouring of channel surface or construction of rock scour protection at toe and discharge location

A Log Book will be kept on site with the Quarry Manger required to make entries at least weekly, and after rainfall.
The Log Book will record;

- Volume and intensity of rainfall
- Condition of any soil and water management works
- Condition of vegetation
- Dust prevention strategies that were implemented
- Any remedial works undertaken

6. Groundwater Monitoring

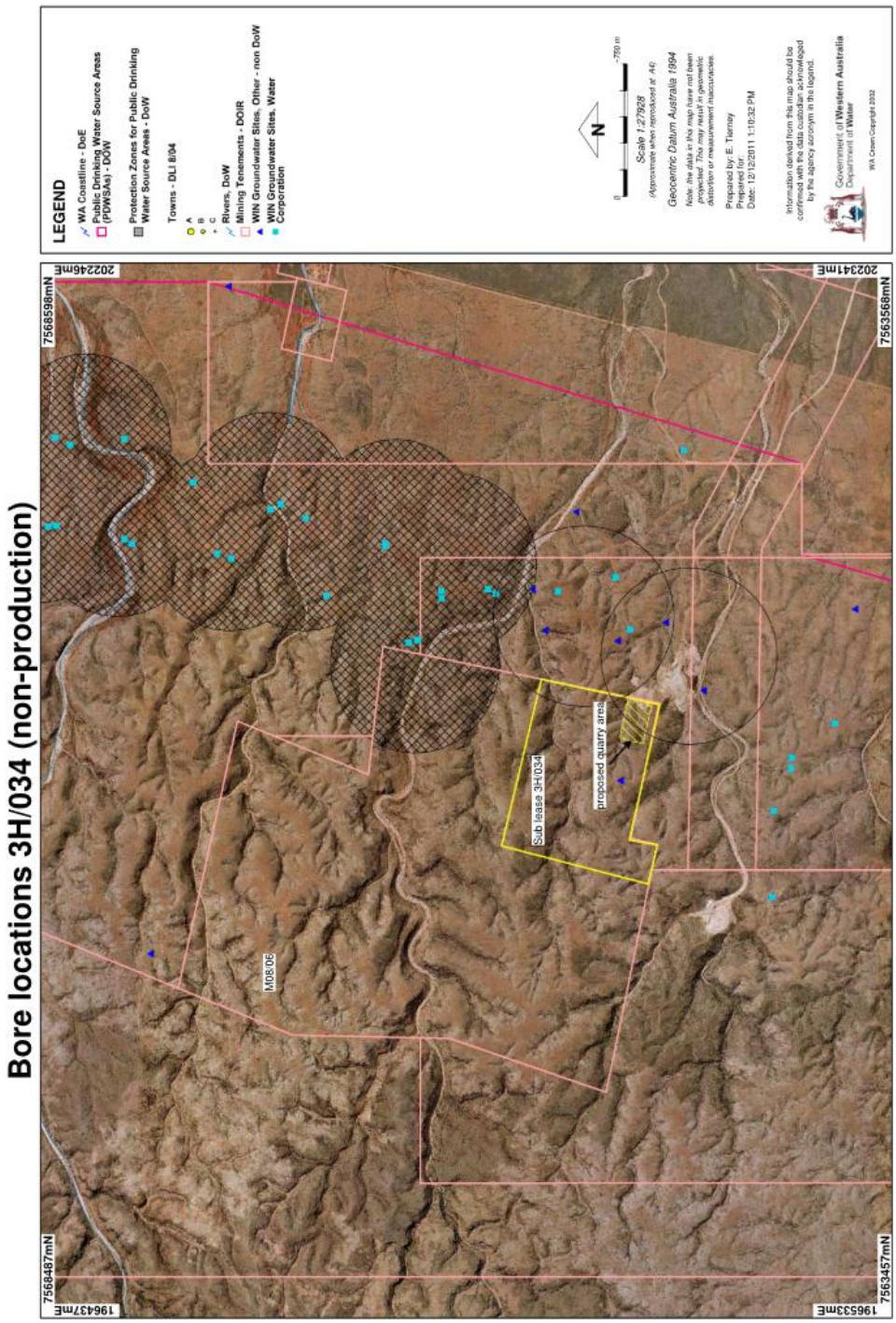
6.1 Introduction

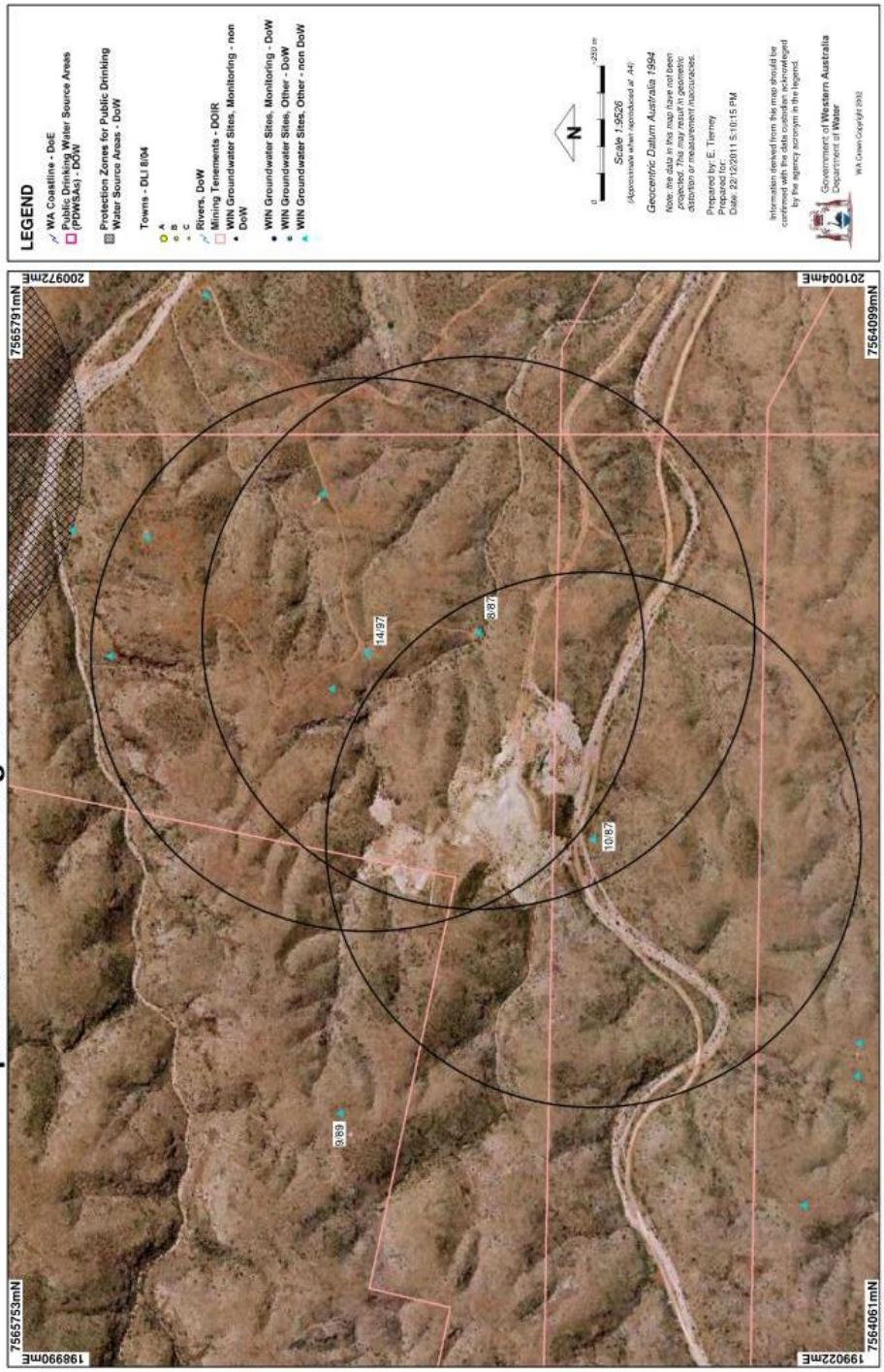
This section is summary of the proposed Groundwater Monitoring Programme to be initiated by Exmouth Quarries and Concrete with guidance from Dept of Water to ensure regulatory requirements are fulfilled before the initiation of the programme.
This Groundwater and Analysis plan is based upon the recommendation made in the EPA prepared scoping guideline Assessment no. 1874, for the Exmouth Quarries and Concrete proposed Quarry. The requirements for groundwater monitoring were as follows:
Groundwater monitoring and management program to demonstrate there are no adverse impacts on the groundwater because of mining activities.
This monitoring program will establish a monitoring network prior to the commencement of mining to ensure there is sufficient baseline information on groundwater levels and quality to identify seasonal trends and for comparison when assessing possible impacts of mining on the groundwater resource.
The monitoring network will monitor within the Exmouth Water Supply Central Subarea.
Groundwater sampling will be undertaken on a quarterly basis from the groundwater observation bores for analysis of the parameter: -pH, electrical conductivity (EC), total dissolved solids (TDS), and TPH (BTEX.
Groundwater and monitoring will be undertaken on a three monthly basis to enable detection of seasonal fluctuations and any groundwater quality impacts.
The monitoring program will be used to identify impacts, in addition to this; data collected will be used to assist the Dept. of Water to further develop existing groundwater models of the aquifers and water quality.

6.2 Monitoring Sites

The groundwater-monitoring network will comprise existing Production Bores (Water Corp) and non-production Bores (EQC) located within the Central Subarea of the Exmouth Water Supply. The locations of the proposed monitoring bores are shown in Figure 17.

Figure 17 Possible monitoring sites and non-production Bore Locations 3H/034(*Courtesy Dept of Water*)




possible monitoring sites 3H/034
LEGEND
WA Coastline - DoE
Public Drinking Water Source Areas (PDWSAs) - DoW
Protection Zones for Public Drinking Water Source Areas - DoW
Towns - DLI 8/04
A
B
C
Rivers, DoW
Mining Tenements - DOIR
WIN Groundwater Sites, Monitoring - non DoW
WIN Groundwater Sites, Monitoring - DoW
WIN Groundwater Sites, Other - DoW
WIN Groundwater Sites, Other - non DoW
N
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(Approximate when reproduced at A4)
Geocentric Datum Australia 1994
Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.
Prepared by: E. Tierney
Prepared for:
Date: 22/12/2011 5:10:15 PM
Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.
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Department of Water
WA Crown Copyright 2012
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6.3 Aims

The groundwater-monitoring program aims to address all groundwater-monitoring requirements associated with conducting the proposed quarry operation within the Exmouth Water Supply. The primary aim of undertaking groundwater monitoring is to ensure sufficient baseline data is gathered for consideration of the following hydrogeological aspects;

- Temporal and spatial variation in groundwater levels, not an impact issue as EQC is not extracting groundwater.
- Temporal and spatial variation in groundwater quality; and
- Groundwater quality impacts, early detection of groundwater quality changes caused by mining activities.

Some aspects may appear to be overly conservative at the beginning of the groundwater-monitoring program, however that can be justified by the following reason; there is a need to establish full baseline conditions; this typically requires at least twelve months obtaining wet and dry season data. This justification will be reviewed on receivable of requested data from the Water Corporation Bore data and the need for a consistent approach to monitoring for potential impacts.

6.4 Review

The groundwater-monitoring programme will be reviewed annually in view of the monitoring results and development of quarrying activities. The review will reassess the potential impacts and will adapt the monitoring program to the updated risk. It will evaluate the effectiveness of each monitoring location, assess where new locations (in conjunction with Water Corp and DoW) and what modifications to the monitoring program may be needed, and evaluate what impacts may be occurring.
An incident-monitoring round will occur in the event of a significant incident.

6.5 Monitoring Routine

The following monitoring routine will be undertaken;

- Groundwater levels will be monitored Tri- monthly for the first two years following commencement construction to assess seasonal, natural, groundwater fluctuations.
- Thereafter groundwater levels will be monitored quarterly at a similar time each year to eliminate variation from seasonal changes.
- Groundwater sampling will be undertaken on a three monthly basis for the first two years pre-construction and operational, from at nominated non-production bores by EQC.
- Samples and Levels are currently taken from Water Corporation Production Bores for analysis of the parameters-pH, electrical conductivity (EC); total dissolved solids (TDS) negotiations are in progress or this to continue with the addition of TPH (BTEX) parameters.
- Measurement of precipitation and evaporation will occur on site daily, and intense rainfall events with estimation of runoff volume will be recorded.

6.6 Groundwater Sampling

Quality Assurance and Quality Control (QA/QC) samples and procedures will be implemented.
The groundwater monitoring is undertaken based on the requirements in the National Water Quality Management Strategy No. 7a *AUSTRALIAN GUIDELINES FOR WATER QUALITY MONITORING AND REPORTING, ANZECC & ARMCANZ* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand), (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* and ANZECC, ARMCANZ- *Australian Guidelines for Water Quality Monitoring and Reporting*, 2000;
and the Australian New Zealand standard AS/NZS5667.1:1998: Water quality – Sampling Guidance on design of sampling programs, sampling techniques and the preservation and handling of samples (Standards Australia, 1980).

6.6.1 Method of Sampling

The method of groundwater monitoring will be undertaken following the procedure outlined below. Note that these procedures are not exhaustive to good sampling practices:

- Depth to water table will be measured using a calibrated level meter;
- Bores to be purged at least three well – volumes of groundwater using a submersible pump or baler. Purged water will be disposed of to adjacent land. The method of purging will be tailored to be the parameters being analysed to ensure accuracy of result;
- Analysis of physio-chemicals parameter will be undertaken during the purging of each bore using a calibrated water quality (multi-parameter) meter. Calibration records will be will be collected and stored as part of the QA/QC program. Recording of the required parameters will be taken throughout the purging process;
- Collection of groundwater samples will be undertaken following the purging of each bore. Effective purging is demonstrated by the stabilisation of water quality parameters (EC, pH and temperature);
- Collection of groundwater samples, sampling devices will be dedicated and/or disposable for each sample or otherwise decontaminated between sampling locations. Rinsate samples are included in the QA/QC program;
- Groundwater samples will be collected in laboratory supplied sampling containers, which will have correct preservative additive, for the analysis required. The samples will be submitted for analysis to a NATA accredited laboratory within the holding time with competed Chain of Custody documentation;
- All sampling events will have QA/QC program regiments and QA/QC sample analysis will be verified to validate integrity of the data collected.

6.6.2 Documenting of Monitoring and Monitoring Results

All documentation related to groundwater monitoring will be kept on archive, and be readily accessible to facilitate ease of data analysis against regulatory criteria and monitoring trigger values.

Depending on the medium for recording the field monitoring data, relevant monitoring documentation may include (but not necessarily limited to)

- Hand recorded field observations and data recording
- Electronic data records and download information
- Calibration records for field monitoring equipment
- Photographs of monitoring sites or potential issues of concern
- Laboratory analytical results reports, including chain of custody records
- Summary and records of quantities of releases of hazardous materials to the environment, including small spills
- Internal technical memorandums detailing the results of monitoring programs; and
- Monitoring reports prepared for submission to DoW and DMP.

An organised internal approach to data management and monitoring documentation will significantly enhance the intended benefits of the monitoring program, and facilitate the identification of potential issues of concern in a timely manner, such that the appropriate contingency; actions can be implemented if warranted.

6.7 Validation and Implementation of Monitoring Programme

Consultation in regard to assessment and implementation of the groundwater monitoring program are being conducted through the Dept of Water(Hydrogeoligist) and the Water Corporation in view of the monitoring program itself, monitoring results and development the of mining activities. The review of the groundwater-monitoring program will re-assess the potential impacts and will adapt the monitoring to the updated risk rating. It will evaluate the effectiveness of each monitoring location, assess where locations and modifications to the monitoring programme may be needed and evaluate what impacts may be occurring. A special monitoring round will occur in the event of a significant environmental incident. The annual review of the groundwater-monitoring programme, including the analysis of results, will be submitted to Dept of Water, Water Corp and the DMP (in Annual Environmental Report).

7. Rehabilitation (and Closure Management Plan)

7.1 Introduction

An essential part of EQC proposed Quarry is the development of a *Mine Rehabilitation and Closure Management Plan* that outlines a plan for decommissioning the facility and mitigating impacts once mining activities have ceased. The preparation of a rehabilitation and closure strategy during development of the Project is an integral part of the closure design process. This approach to mine planning recognises that mining represents a temporary use of the land and that appropriate closure of the operation is in line with the sustainable use of available resources. This *Mine Rehabilitation and Closure Management Plan* brings forward the concepts laid out in the manner that supports the Environmental Impact Assessment (EIA) process.
The *Mine Rehabilitation and Closure Management Plan* addresses closure activities associated with four different scenarios:

- preparation and planning for closure during operations
- rehabilitation measures during closure
- rehabilitation measures during states of inactivity
- activities in the post-closure phase

7.2 Objectives of the Mine Rehabilitation and Closure Management Plan

The principal goal of the closure process for the MI08/06 SL311/344(Alcoa) Project is to ensure that the potential environmental, economic, and social impacts associated with the decommissioned mine (together with their associated financial and legal liabilities) are identified at an early stage. In addition, these impacts will be minimised because of actions taken during the design, construction and operational phases of the Project. These actions will help to reduce the post-closure care required and overall closure costs at the end of mining.
Another important goal is to design closure activities in a manner that minimises the need for extended care and maintenance operations by EQC or whoever will assume responsibility for the rehabilitated mine over the long-term under agreed handover provisions.
Based on these goals, the objectives of the Project *Mine Rehabilitation and Closure Management Plan* is as follows:

- to transparently inform the public, regulatory authorities and all involved stakeholders about the closure and post-closure phase and the measures foreseen to achieve the beneficial after-use and minimize environmental impacts;
- assist management in ensuring the protection of Exmouth Water Supply during and following closure of the quarry;
- allow progressive closure activities to commence before production ceases;
- restore disturbed land to a Biodiversity condition as soon as practical:

7.3 Approaches to Mine Rehabilitation and Closure Management Plan Development

This section entails a summary of EQC *Mine Rehabilitation and Closure Management Plan, Mining Plan and Environmental Management System.* Which have been developed in consideration of guidelines for Mine Closure and Mine site Rehabilitation guidance material in accordance with DMP and OEPA Guidelines. The *Mine Rehabilitation and Closure Management Plan* will be reviewed and updated as appropriate on a periodic basis. It will also be reviewed and updated as part of the management review process, since environmental legislation, reclamation practices, and mine operations, are expected to change with time, as may other aspects of the *Mining Act, 1978,* that will need to be addressed in later phases of the Project (see Section 2). This will ensure that the Plan addresses the current mine plan and legislation.

7.4 Financial guarantee for mine closure

EQC takes all reasonable effort to minimize environmental damage and restore environment so that no environmental liability remains. Financial resources are secured for closure and post-closure phase to rehabilitate mine site and leave no environmental liability behind without sufficient financial resources to remedy any environmental damage.
Three components must be clearly distinguished:

- The technical concept of mine closure, time estimates of the activities including the post closure phase is contained in the Mine Closure and Rehabilitation Plan.
- Cost estimates, which are broken down according to the relevant activities and periods are provided as part of the Review Report.
- .Arrangements of financial instruments to guarantee the funds are available when they are needed, including the calculations of the financial net present value (i.e. discounted future expenditures) etc. These are provided by EQC in the appropriate form.

7.5 General Guidelines for Closure

Guidance for environmental management and mine closure planning is provided by Dept of Mines and Petroleum and the Environmental Protection Authority (2011) *Guidelines for Mine Closure Plans* and other internationally accepted standards. The Project *Mine Rehabilitation and Closure Management Plan* address technical, environmental and economic elements. It is understood that these documents will be adjusted in response to periodic evaluation and integration of changing future land use interests, regulatory changes, and other stakeholder input as part of the management review provisions in the Exmouth Quarries and Concrete Environmental Management System(ISO9000:2008).

7.6 Objectives for Closure

Objectives for rehabilitation need to address regulatory requirements, site-specific aspects, EQC policies and best industry practice, which include the following:

- Establish Fauna habitat;
- Erosion protection;
- Restoration of creeks and riparian vegetation along the tributary creeks;
- protection of public health and welfare;
- achievement of agreed-upon goals for post closure land use;
- geotechnical stabilisation of mine-related structures;
- reclamation of landscape to minimise sediment transport, erosion, and potential environmental harm;
- water quality and quantity protection; and,
- Air quality protection.

The low annual rainfall on the Cape Range peninsula results in slow plant growth and can leave landforms highly susceptible to degradation and erosion. Optimum times for seeding and planting would be assumed to be able to occur each year during May/June, this is only indicative forecasting and all rehabilitation work will need to be adjusted to climatic changes and opportunities that are presented for example cyclonic and large rainfall events. Only provenance correct species will be used in the rehabilitation program. Clearing outside of the immediate mining area will not occur. These objectives can be met providing appropriate technical guidelines and standards are used early in mine planning and closure designs. Detailed rehabilitation objectives for the Project are listed below in table form with a description of the elements within each item.

Table 25 Rehabilitation and Closure Objectives

	Objectives
Rehabilitation	• to restore mined areas to a state based on surrounding undisturbed vegetation communities that, are resilient, self-sustaining and where ecosystem processes have been re-established and to increase knowledge and understanding of flora and fauna to provide for best practise management of the lease and to monitor impacts
Safety and Security	• a safe and secure environment for humans and wildlife for the long term; • stabilization of slopes (e.g. of pit walls, waste dumps, dams) so that no hazard remains after final closure; • restriction of access to specific areas where appropriate to ensure undisturbed development of vegetation which needs care and maintenance over several year:
Management of Environmental Effects	• reduction or elimination of the need for a long-term management program to control erosion, water quality and to minimise the long-term environmental effects; • groundwater assessment and control where necessary; • clean-up, treatment, or restoration of contaminated areas (e.g. soils contaminated by oil or fuel spills or spills of reagents) with contaminated material excavated and disposed of in an acceptable manner wherever necessary:
Site Clean-up	• removal of surface structures and equipment; • removal of all hazardous or designated substances and safe and acceptable disposal or storage:
Erosion Protection	• stabilisation of mine development waste areas: waste rock stockpiles, surface • drainage basins, • surfaces profiled and designed to achieve long-term stability under peak run-off conditions based on emepheral creek flow patterns • surface areas to be vegetated or otherwise stabilised to minimise wind and water erosion:
Productivity of the Site Vegetation	• provision of site conditions to allow the natural invasion of indigenous vegetation on the site to begin; • establishment of a vegetation base that will enable natural species to begin the process of recovery toward the quality and productivity of the adjacent environment, • depending upon the land use objective selected scarification, fertilisation, and seeding of roadways and pads; • seeding or hydro-seeding of sloped embankments, and placement and fertilisation of natural covers; and covering and hydro-seeding of waste rock stockpiles according to best management practice technology, where applicable:
Aesthetics	• Objectives include the landscaping of highly visible rock stockpile slopes, pit slopes and to improve aesthetic appearance, as necessary, and in accordance with the defined after-use scenarios for the post-mining landscape.

7.7 Management Measures during Operations

The rehabilitation and restoration of land surfaces impacted by mining activities will be conducted as soon as possible after the disturbance occurs. Progressive vegetation of disturbed areas will reduce erosion, improve water quality and increase fauna habitat, part of the closure and decommissioning activities and will be in accordance with selected elements of the *Environmental Protection and Conservation Act*. This strategy will be guided by the future planned land use. In general, the rehabilitation and restoration of land areas impacted by mining activities will be divided into to two major sets of activities, which are described as follows:

Mechanical stabilisation of the surface, including surface levelling and scarification (to promote appropriate drainage patterns) and the backfilling of significant depressions or pits using on site borrow materials, typically spread in individually compacted layers.

Revegetation of stabilised land surfaces, which includes:

- Covering of prepared (i.e. levelled, scarified, and compacted) rehabilitation areas with a topsoil material taken from reserved topsoil stockpile
- Soil fertilisation, as necessary
- Seeding with indigenous perennial herbage
- Planting and organic fertilisation of provenance species; and watering of the revegetated surfaces in stages the overall purpose of these activities will be to prevent erosion as well as harmonise the rehabilitated areas with the natural surrounding and assist in the enhancement of local and regional biodiversity.

At a minimum, revegetation procedures will consider the guidelines listed below:

- In order to avoid damaging the soil structure and site drainage capabilities, no planting operations will be carried out in unfavourable weather conditions or in excessively damp soils
- Weeds will be removed and destroyed prior to replanting any area of the site
- The use of excessively heavy equipment and repeated vehicle runs over the same replanting area will be avoided
- After planting, no heavy equipment will be used on the planted areas. Any planted area affected by such inappropriate equipment, will be rehabilitated
  The deposition of the stockpiled topsoil over prepared soil beds and around saplings will be accomplished in layers not exceeding 150 mm. Each layer will be slightly compacted before spreading of a new topsoil layer
- Large-diameter stones and refuse will be removed during topsoil reclamation and spreading
- Adequately dried and workable topsoil will be levelled and sloped to ensure effective drainage. Any minor recesses, pits, or hillocks will be removed
- Manufacturers' recommendations will be followed concerning the storage, handling and spreading of fertilisers and herbicides. Empty chemical containers will be disposed of as specified in the *Environmental Management Plan*
- Planting will occur in early spring or late autumn, as soon as possible after the delivery of trees to the site. If planting needs to be postponed, the plants will be protected against degradation or unfavourable weather conditions
- Pits for saplings dug on inclined surfaces will have vertical edges and a horizontal bottom; diameters will be large enough to accommodate fully stretched roots
- All newly planted vegetation will be protected using protection fences and/or supporting stakes

Table26 Operational rehabilitation Objectives

Key objectives	Achieved by:
To re-establish diversity of native plant communities and vegetation structures. To reduce impacts of weeds on the conservation values of the lease. To re-establish diversity and protect rehabilitated areas from inappropriate fire frequency.	Managing mining operations to avoid unnecessary disturbance Designing and siting facilities to minimise area requiring rehabilitation and ongoing degradation. To re-establish the diversity of native fauna and habitat types and to maintain stable populations at the completion of mining Identifying and implementing integrated monitoring programs, as resources permit and according to priority. Monitoring will focus on the key values relevant to successfully implementing this management plan. Database development and maintenance highlighting historical, current and required actions Relevant information will be stored and updated when required and used, if necessary to modify management plans Incorporating monitoring findings into interpretive material where appropriate Considering soil conservation, revegetation and introduced plant control programs in an integrated way across the wider landscape involving adjacent landowners

7.8 Rehabilitation Earthworks

7.8.1 Final Landform

In order to retain respread topsoil and to sustain subsequent re-establishment of vegetation, slopes must be stable and, the reshaping and grading of the site is an essential component of this process. Slopes of 20 degrees or less with a slope run of 50-60m between benches will be established to enhance the capacity to retain water on site. Moon-scaping on steeper slopes will be used as alternative to create niches for plant growth due to increased water-holding capacity. Excavators will be used for the majority of landscaping work. Cross section diagram are shown in Figures 17 and 18 following.

Figure 18 Final Landform - West-East Cross Section.

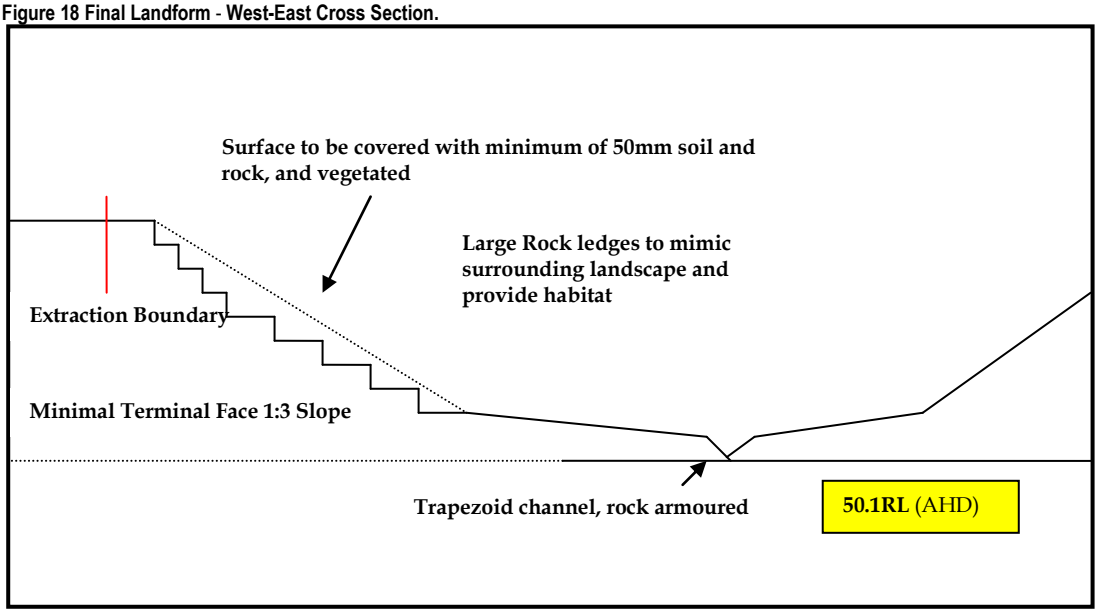
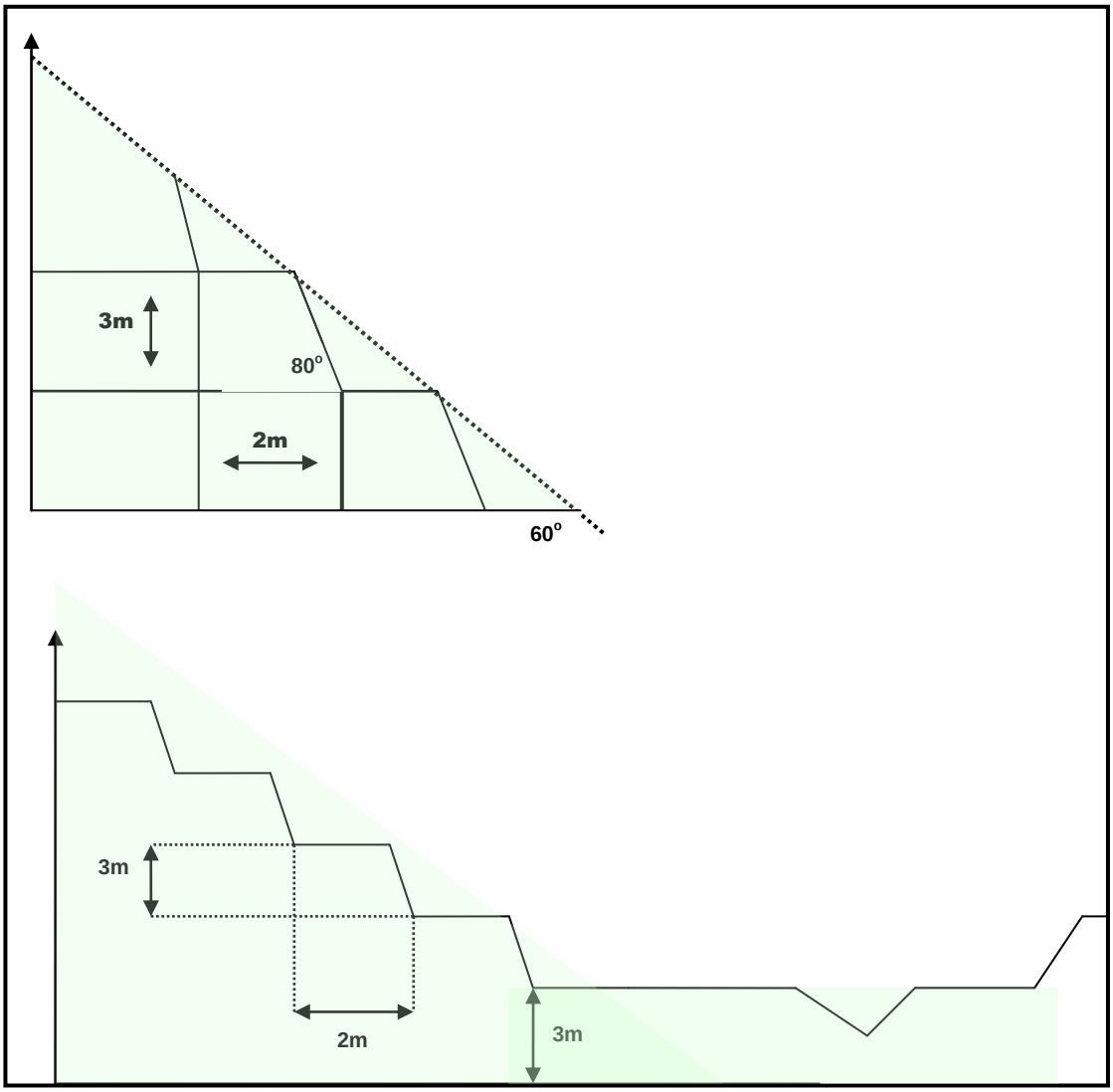


Figure 19 Revegetation Benches - Cross Section



7.8.2 Soil Stockpiling

The top 10-20 cm, referred to as top soil, is first removed this is followed by the removal of an additional soil known as the *overburden.* The overburden and topsoil, which contains most of the soil organic matter, nutrients, microorganisms, and seeds, is stockpiled for future use.

7.8.3 Reduction of Wind Erosion

Three basic methods of controlling wind erosion will be utilised:

- Protection of the exposed surface by the use of brushing material obtained from clearing activity on the lease site only
- Establishing wind breaks if required
- Leaving the final surface rough, to assist in controlling erosion

7.8.4 Reduction of Water Erosion

Intense thunderstorms and run-off events are a feature of the Cape Range climate. Water erosion measures will be undertaken to reduce the effects of such storms. Refer to Section Protection of Exmouth Water Supply.

7.9 Establishing Plant Growth Medium

7.9.1 Topsoil

Topsoil contains seeds, soil organisms and nutrients, which are all vital to the successful re-establishment of vegetation. At the Lease site, topsoil is a scarce commodity. As the initial mining zone contains no topsoil, the most feasible plan, to prevent introduction of weed species and disease for rehabilitation processes is to utilise part of the topsoil removed in Stage 2 for establishing niche areas within the original mining zone.
The following methodology will be undertaken:

- Direct placement of 50% of recovered topsoil onto 1st Stage mining area will be utilised to prevent deterioration of the biological component.
- This will occur with the establishment of niche zones within the contoured site to maximise plant regrowth, to assist with colonisation, establishment of litter and assist in catchment of soil from run off events
- The remaining 50% of topsoil will be stockpiled, in piles less than 1m high with brushing and vegetation establishment to protect from erosion, to discourage weeds and to retain soil microbial populations
- Topsoil will be augmented with an underlay of subsoil with reasonable properties for plant growth, utilising fines from the limestone processing
- After topsoil is spread, deep ripping of the surface on contour will be undertaken to key the soil material to the pit floor.

7.9.2 Seedbed Preparation

Seedbed preparation involves the roughening of the surface to provide niches in which seeds can lodge and germinate, while also increasing water availability for establishing plants.
The following operations will be undertaken in preparation for seeding:

- Ripping and preparation will be undertaken just before the onset of winter rains. It is envisaged to rip in March/April to catch most reliable rain in May/June
- No surface preparation will occur during rain events to reduce the risk of erosion
- Fertiliser application is not considered necessary and may encourage proliferation of weed species

7.10 Establishment of Vegetation

7.10.1 Species Selection

Species selection is dependent on several factors including soil type and position in the landscape. In arid zones, re-establishment of a diverse and permanent plant cover is the primary objective.
Species have been selected with the following considerations;

- Observation of plant species growing naturally on disturbed sites adjacent to mining area to identify successful colonising and mid-successional species
- Observation of soil and drainage conditions in areas to which local species are adapted that mimic those on the mine site.
- Selection of plant species with significant production of viable seed for harvest
- Consideration of habitat requirements of local wildlife
- Selection of a variety of species to include low, middle and upper-storey vegetation layers

Soil types within the lease and mining area have been identified and the species with the best chance of survival have been selected. This information is retained on database and will be forwarded to the DMP with the Annual Environmental Report.
Analysis of the flora surveys indicated the following plant associations that exist on the lease area.

Table 27 Plant Associations

Location	Association
Ridge summit and slopes	*Melaleuca cardiophylla*, some *Acacia arida*, *Eucalyptus xerothermica*, low woodland consisting of *Acacia tetraegonophylla*, *Dodloneaea viscosae*, *Grevillea calcicola* over *Triodia pungens*, *Swainsona leeana* and *Ptilotus exaltatus*.
Lower slopes – primarily north facing	*Acacia bivenosaea*, *A. corriaecea* ssp. "Cape Range Form", *Eucalyptus xerothermica*, low shrubland over *Triodia wiseanna*, some *Accacia pyrifolia* and Solanum spp.
Creek lines and walls	*Eucalyptus* sp. "00", *Brachychiton obtusilobus*, *Acacia coriacaea* ssp. "Cape Range Form", *Acacia alexandri*, *A.pyrifola*, *Hibbertia spicata* ssp. *spicata* over *Corchorus crozophorifolius*, *Triodia pungens* and, *Eragrostis dielsii*, occasional *Senna glutinosa*.

7.10.2 Selected Species List for Propagation and Direct Seeding

A range of species has been identified as being suitable for inclusion in the rehabilitation areas and these are listed below.

Table 28 Selected Species for Propagation and Direct Seeding

Annual and perennial Grasses	Annual herbs and short-lived perennials	Shrubs less than 3m	Trees and shrubs over 3m
Eragrostis dielsii *Triodia pungens* *Triodia wiseana*	*Convolvulus erubescens* *Euphorbia drummondii* *Goodenia tenuiloba* *Ptilotus rotundifolius* *Ptilotus obovatus*	*Dodonaea viscosa* *Eremophila freelingii* *Exocarpos aphyllus* *Corchorus elachophorus* *Corchorus crozophorisfolius* *Senna artemisioides ssp olsophylla* *Senna glutinosa ssp glutinosa* *Acacia bivenosa* *Acacia arida* *Acacia colorata* *Acacia gregori* *Acacia alexandri* *Hibertia spicata ssp spicata* *Melaleuca cardiophylla* *Solanum lasiophyllum*	*Brachychiton acuminatlis* *Grevillea calcicola* *Acacia corriaecea ssp Cape Range Form* *Acacia pyrifolia* *Eucalyptus xerothermica* *Eucalyptus sp "00"*

7.11 Seeding and Planting

7.11.1 Seed Acquisition

All seed will be collected on site, with collection occurring from a range of areas to ensure match to range of associations and position.
All seed will be tested for germinability before application in the rehabilitation program.
Seed currently being stored is tested for germination and viability and data recorded.

7.11.2 Direct Seeding

Broadcasting of 6-10 kg of seed per hectare will be undertaken directly onto the prepared seedbed. This will include a mix of species, including annuals or early ground cover, shrubs of all sizes and some low storey species with the following ratios;
25% - Annual and perennial Grasses;
25% - Annual herbs and short-lived perennials;
25% - Shrubs less than 3 m
20% - Trees and shrubs over 3m and;
5% - Other species
Bush litter will be gathered from adjacent areas will be used in addition to formal seed mix applied.

7.11.3 Propagation

A 30% planting of propagated species within niche zones created with topsoil will be conducted. Propagation will occur at a specifically designed and operated Nursery at the Town site Quarry. All aspects of Nursery operation and management, in regard to hygiene and processes will occur according to industry leading practice. All stock grown will be sourced from provenance seed collected at lease site before mining operations commence.
All of the seed viability and germination for direct seeding operation will be conducted at this nursery.

7.11.4 Seed Storage

All seed collected will be cleaned, dried, labelled and protected from insect attack.
Winnowing will be used to separate vegetative matter from seed and to prevent fungal growth. Storage will be at less than 10% humidity to maintain viability. As seed viability varies with age, re-checks of seed lots will be undertaken periodically.
Seed collection, preservation and storage data will be recorded and attached to the Annual Environmental Report.

7.11.5 Fauna Habitats

Conservation of the diversity of native fauna and habitats types and the maintenance of viable populations will be achieved by;

- Managing factors that can lead to loss of faunal habitat, for example introduction of environmental weeds and alterations of groundwater levels and quality
- Control of introduced or problem animals and consideration of re-introducing local species, through natural attrition when their habitat requirements are met in the rehabilitated area
- Ensuring that special fauna conservation values are considered; for example reptile and subterranean fauna habitats will be constructed during rehabilitation process through the placement rock to create small voids
- Restricting access at specific locales and times as necessary

7.11.6 Monitoring

Monitoring will occur at the lease prior to mining operations and then will begin at the initial planting stages of each zone, with the establishment of photo points and site assessments.
Key criteria that will be monitored are site stability, Vegetation quality, Biodiversity, Weed density, Regeneration and planting success and Fauna observations.

Table 29 Monitoring Objectives, Output measure & Performance Indicators

Objective	Output Measure	Performance Indicator
Progressive development of final landform Including measures to reduce erosion, utilising reshaping and grading to sustain subsequent revegetation and water flows	Construction of 20 degree slopes Slope run of 50-60 m between benches. Reduction of wind and water erosion	Capacity to retain water on site Change in rehabilitation quality over time, measured by an increase in number of target species Evidence of active erosion, gullies or rills or exposed roots 70% of the plant cover of undisturbed areas
Preservation and storage of any topsoil located in immediate mining zone	Direct placement of 50% of topsoil into niche areas Storage of 50% topsoil and sub-soil components Placement of topsoil/subsoil onto faces	Change in rehabilitation quality over time, measured by an increase in number of target species. Measurement of alkalinity/salinity and microbial quality
Utilisation of provenance correct seed collection, storage and propagation for the rehabilitation of mined areas	Seed Collection and viability Seed Storage Seedbed Preparation	Required collection statistics and records Testing Germination to achieve rate of 30% Viability germination rate during storage Testing Germination to achieve rate of 30% Change in rehabilitation quality over time, measured by an increase in number of target species
To conserve the diversity of native fauna and habitat types and to maintain viable populations of fauna	Diversity of native fauna species and habitat Population numbers and range of fauna species	Increase of species or habitat diversity over life of plan Increase over the life of the plan

7.11.7 Monitoring Techniques

Table 30 Monitoring Techniques

Method	Monitoring	Parameter	Frequency
Photo Points	Weeds seedlings Regeneration	Assess the condition of revegetation	Each site prior to on-ground works Immediately after on-ground work. At regular intervals as a visual record of change
Transect	Planted Seedlings Establishment from applied seed Identified plants	Survival counts (% and/or species) Absence/density A gross tally of including both alive and/or dead	Autumn the year after planting or seeding(to determine survival rates over summer) Annually (Sep/Oct)
Hoops Monitoring	Germination rates of direct seeding Establishment from direct seeding Seedling survival over time	# species per metre square (diversity) # Plants per metre square (density)	Three months post seeding/planting (Sep/Oct) of following years
Permanent Vegetation Quadrats	Revegetation structure, health and species dominance Mature revegetation sites (seedlings or direct seeded) to asses structure health and species dominance Basic description of conditions at the site	Photo Point Survival counts (% and/or species) A gross tally of including both alive and/or dead # species per metre square (diversity) # Plants per metre square (density)	Annually Sep/Oct

7.11.8 Long Term Management

The long-term management involves continuing controls and maintenance to achieve stable landform, creek channels, riparian corridors and vegetated areas. The process includes the maintenance of land surfaces. Maintenance will occur for at least two years to ensure the long-term stability of the initial rehabilitation. Once the vegetation is established and the bank stabilisation is considered adequate the constructed Earth basin will be removed and a channel created through the Earth Wall to re-instate flow from the ephemeral gully creek.

7.12 Completion Criteria

7.12.1 Key Performance Indicators

Table 31Key Performance Indicators

Phase Description	Key Objectives	Measurable Outcomes	Monitoring/ Evaluation	Monitoring /Reporting
Site Assessment	Flora and Fauna Survey	Recorded Data Photo points	Data Photo points	Pre-mining
Mining Plan	Development of access roads and infrastructure placement	Tonnage Vegetation Monitoring	Monitoring of adjacent vegetation within100Mof mining site	Pre-mining
Seed collection and storage	Collection and storage of provenance seed from within mining zone [limited] Collection and storage of adjacent provenance seed	Volume and number of collected seed	Database of collection and viability of seed	Pre mining Monthly
Final Land form Reshaping and grading of site for slope stability and retention of topsoil. Sustainability of revegetation	Establish slopes of 20 degrees or less. Slope run of 50-60 between benches Possible moon scaping of steeper slopes	Capacity to retain water on site Change in remnant quality over time, measured by an increase in number of target species.	Revegetation monitoring Erosion monitoring -	Bi-annually |Photo point Prior, after ground works Annually -spring
Water and Wind erosion	Establishing rough surfacing Deep ripping to prevent compaction Back sloping benching and vertical draining	Evidence of active erosion, 70% or more of area of remnant vegetation cover	Site evaluations Revegetation monitoring	Bi-annually
Topsoil	Introduction of humus matter collected onsite to retain microbial activity. Aim to place layer 15cm thick at revegetation site. Deep contour rip after soil is spread.	Change in remnant quality over time, measured by an increase in number of target species	Revegetation monitoring Soil profile monitoring	Bi-annually
Seed Acquisition	Seed collection undertaken pre-mining within mine site During mining at adjacent areas 500-1000 m from site works	Volume and number of collected seed	Database of collection and viability of seed	Monthly
Phase Description	**Key Objectives**	**Measurable Outcomes**	**Monitoring/ Evaluation**	**Monitoring /Reporting**
Seed Storage	Seed cleaned, dried, labelled and protected from insect attack. Storage at less than 10% humidity and control of insect predation to maintain viability	Regular viability checks	Viability germination rate during storage Testing Germination to achieve rate of 30%	Monthly
Seedbed preparation	Contour ripping and seedbed preparation prior to reliable rain season(April/May)		Soil profile monitoring	Pre-Planting
Direct seeding in conjunction with of propagated plants.	6 –10 kg per hectare Plant seedlings after first rains, but not when surface is still wet	Change in remnant quality over time measured by an increase in number of target species	Revegetation monitoring Soil profile monitoring	Hoops, 3 months post seeding Spring annually Quadrat – spring annually
Maintenance	Continued monitoring Pest and weed control	Flora and Fauna surveys	Monitoring data	Annually

7.13 Rehabilitation Measures in the Event of Temporary Suspension of Operations

7.13.1 General measures

EQC will take all statutory and reasonable measures in line with policies to minimise environmental impacts, if quarry operations are in a condition of temporary suspension.
Temporary suspension means the planned or unplanned suspension of operations with protective measures (including continuous monitoring) in place. Under such circumstances, efforts will focus toward returning the quarry to normal operational conditions at the earliest time.
In the event of a temporary suspension of operation, EQC will notify appropriate government agencies. Although in such circumstances EQC would have the full intention of resuming operations as soon as possible, a temporary suspension could conceivably entail a lengthy period when the circumstances leading to the interruption in operations are outside of EQC's control.
The following minimum rehabilitative measures will be implemented as necessary for the EQC Quarry Project in the event of a temporary suspension:

- reasonable measures will be taken to restrict access to the site to authorised persons only;
- mine openings that are potentially dangerous will be closed-off against uncontrolled and unauthorised access
- mechanical and hydraulic systems will be removed
- physical, chemical, and biological monitoring programs will be continued
- waste management systems and waste will be removed
- waste rock and overburden stockpiles will be maintained in a stable and safe condition

7.13.2 Waste Rock Stockpiles

Ongoing work on the waste rock stockpile, including re-contouring, will be completed to the extent that the waste rock stockpiles remain in a stable and safe condition during any period of temporary suspension. If initiated, progressive rehabilitation on the lower lifts of the waste rock stockpile will be completed to the extent possible.

7.13.3 Miscellaneous Facilities

The miscellaneous facilities in the plant area, as well as the mining machinery and equipment, storage tanks and other facilities will be removed.

7.13.4 Site Water Management

The site water management strategy during a period of temporary suspension will be to avoid build-up behind impoundments. This will be achievable through a system of collecting and releasing unimpacted surface water directly to the environment.
Specifically, diversion channels around the collect and route unimpacted surface water past these retention structures for discharge to Stony creek tributary.

7.13.5 Rehabilitation Measures

EQC will take reasonable measures to minimise environmental impacts during periods of inactivity. "Inactivity" means the indefinite suspension of a project in accordance with a field closure plan where protective measures are in place and the proponent is monitoring the site continuously. The following measures will be taken:

- Mine workings will be assessed by a qualified engineer to determine their stability
- Any surface areas disturbed or likely to be disturbed by such mine workings will be stabilised or, if stabilisation is not practicable, will be protected against inadvertent access if such disturbance is likely to endanger the public or property; Rock stockpiles, overburden stockpiles, stockpiles, and systems will be monitored and maintained, or rehabilitated

8. Other Environmental Factors and their Management Measures

8.1 Risk Factor Mitigation and Management

Table 32 Risk Factors and Mitigation

Factor	Mitigation	Management
Control of Invasive Species	Establish and implement a program to control and/or eradicate noxious weeds and pest animals within the lease area. Take measures to prevent the spread of declared noxious weeds, pest animals and plant diseases within the area. Ensure that all mobile machinery is thoroughly cleaned prior to coming onto, or leaving a Work Area affected by noxious weeds and/or plant diseases. Ensure that all soil that is exported out of the area is free of disease and noxious weeds.	All of the workforce are trained to be familiar with noxious weeds in the area and can regularly inspect a site for the presence of noxious weeds. Implement plan to manage noxious weeds, and pest animals as per EMS, employing appropriate control or eradication measures. All heavy equipment will be cleaned before entering or leaving site of all soil and organic matter in designated onsite wash-down area.
Fire Management	Take all reasonable measures to prevent the ignition and spread of fire and ensure that all, plant and mobile equipment are fitted with fire-fighting equipment, such as fire extinguishers, fire blankets, knapsack spray pumps and rake-hoes.	Develop a fire management plan. Maintain appropriate fire fighting equipment at site. Check the undersides of vehicles periodically to ensure they are kept free of vegetation debris that could dry out and ignite.
Hazardous Materials Management	Prevent contamination of the environment by the release of fuels, lubricants and/or hazardous materials. Ensure that all fuels, lubricants and/or hazardous materials are handled in accordance with the relevant requirements of *AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids*. Ensure that spill prevention and clean-up equipment is readily available and accessible near all plant and machinery, including mobile and fixed fuel storages.	There will be no storage of Hazardous Materials on the Quarry site. Occupational Health and Safety guidelines will be followed on site and spill response training undertaken in conjunction with advice received from Fire and Emergency services.
Spill and Leak Response	Ensure that spills of fuels, lubricants and/or hazardous materials are cleaned up as quickly as practicable. Spills will not be cleaned up by hosing, sweeping or otherwise releasing such contaminant into waterways. Equipment and soil contaminated by fuels, lubricants, and hazardous materials and clean up substances, which cannot be salvaged, will be disposed of in an approved waste facility.	An emergency response plan has been developed to address spills and leaks. Trays will be installed beneath stationary machinery to protect the soil from oil or fuel spills and leaks. Spill trays will be installed immediately if there is any potential for, or evidence of, leakage. Appropriate clean-up equipment is readily accessible containing, a supply of oil-absorbent material. Spills and leaks will be contained and treated immediately and the relevant authorities (DEC, DMP) notified of significant spills or leaks.
Noise	Avoid causing unacceptable noise.	**Site Layout** Location of the Quarry site provides an adequate buffer distance between a quarry and sensitive land-users. **Operation Planning** Operating hours limited are limited to daylight hours. Access and haul roads will be maintained in good condition to prevent corrugations which can contribute to truck road noise.

Factor	Mitigation	Management
Dust Control	Prevent dust release that causes adverse impacts to the surrounding area and people.	**Site** Consideration given to the direction of prevailing winds when designing the plant, work faces and stockpile layouts to minimise dust nuisance. **Overburden and Stockpiles** Stockpiles not used for some time will be vegetated. **Vehicle Movement** Minimise vehicle movements, onsite vehicle speeds will be reduced, under dry or windy conditions Water will be Applied to access tracks to prevent raised dust occurring and loads leaving site will be covered or dampened. **Plant** Plant and equipment will undergo regular Service and maintenance so that they are in premium operating condition. Plant and equipment are already fitted with appropriate dust suppression devices, such as water sprays. **Dry, Windy Conditions** During dry windy conditions the process procedure in the EMS is to stop the screening plant, increase use of watering systems and if required stop work in some areas of site.
Visual Management	Take all reasonable measures to reduce visual impact on the surrounding area.	**Site layout** The direction of the working face is shielded from the most critical views, utilisation of the topographic features assist in reducing visual impact. **Operations** To minimise the exposure of bare surfaces, ensuring vegetation used for rehabilitation or vegetative screens is sourced from provenance species and the use of progressive rehabilitation to minimise exposed surfaces and rehabilitate uppermost bench as soon as possible is standard operating procedure
Community	In response to a complaint, the following information is recorded in the complaints register: The date and time of the complaint; Who the complaint was from; The specific issue/s raised in the complaint; and The actions taken to address the specific issue/s rose in the complaint.	EQC intends to be contactable and flexible in dealing with community concerns and issues and to Listen to all community concerns and facilitate a reasoned response to all issues raised. EQC has previously identified and acknowledged special interest groups.

8.3 *Environmental Management Activities – Initial*

Table 33 Initial Environmental Management t Activities

Environmental Management Control	Person Responsible	Timing Frequency	Completed (Initials/Date)	Reference/Notes
General Site Issues				
Site induction training and EMP obligations. Documented evidence.	Quarry Manager	Before commencing then ongoing for new employee/contractors		
Ensure all operations undertaken in accordance with Environmental Protection Act and Regulations.	All site personnel	Ongoing during operations		
Ensure emergency procedures are displayed in prominent position within site working area.	Safety Manager	Before commencing work		
Allocation contact person/numbers for receiving complaints and dissemination of information.	Quarry Manager	Ongoing during operations		EMS 4.3.2
Complaint register established	Quarry Manager	Before commencing work		EMS 4.3.2
EMS audit – Monthly	Quarry Manager	Ongoing during operations		
Indigenous Heritage				
If Aboriginal archaeological sites or artefacts discovered, ensure work ceases immediately and DEC is contacted.	Quarry Manager	Ongoing during operations		
Air Quality				
Ensure all vehicles entering or leaving site is covered to prevent dust emissions at all times, except during loading and unloading.	Quarry Manager	Ongoing during operations		
Operate and maintain dust control measures and/or equipment on the following; o All processing equipment –screening plant o Internal haul roads and disturbed areas o Truck loading areas o All stockpiles	Quarry Manager All site personnel	Before commencing work Ongoing during operations		Installed dust shield on screening plant.
Ensure mobile water tanker used to suppress dust from unsealed roads.	Quarry Manager	Ongoing during operations		
Flora and Fauna				
Bund boundary of working lease areas	Quarry Manager	Before commencing work	Commenced Ongoing	
Brush/vegetate boundary bunds	Quarry Manager Contractor		Commenced Ongoing	
Restrict removal of trees and other vegetation to the minimum required for quarry activities, processing plant and fire control	Quarry Manager	Ongoing during operations		
Collection of provenance seed and propagation	Contractor	Before commencing work then ongoing	Commenced Ongoing	
Rehabilitate and revegetate works of extracted strips progressively.	Quarry Manager	Ongoing during operations		
Establish a riparian zone along the length of reconstructed ephemeral creek in the quarry	Quarry Manager Contractor	Ongoing during operations Post quarrying activities		

Environmental Management Control	Person Responsible	Timing Frequency	Completed (Initials/Date)	Reference/Notes
Water Quality				
Completion of works relating to drainage and sediment control	Quarry Manager	Ongoing during operations	Commenced	
Completion of provision of sediment/ filter traps to prevent contaminated run off leaving site	Quarry Manager	Ongoing during operations	Commenced	
Completion of construction of scour protection/energy dissipation measures in drainage lines below drainage outfall zone	Quarry Manager	Ongoing during operations	Commenced	
Erosion and sedimentation control measures installed prior to commencing land disturbance	Quarry Manager	Before commencing work then ongoing	Commenced	
Ensure drainage through and from areas of disturbance is minimising surface flow velocities.	Quarry Manager	Before commencing work then ongoing		
Noise	Quarry Manager			
Ensure activities are restricted to the following hours 0700 – 1700 Monday to Friday 0800 – 1300 Saturday No work on Sunday or Public Holidays	Quarry Manager	Ongoing during operations		
Waste Management	Quarry Manager			
Remove solid waste and unused structure from site – recycle and dispose options	Quarry Manager	Ongoing	Commenced	
Ensure waste is disposed at a waste facility licensed to accept type of waste presented.	Quarry Manager	Ongoing during operations		
Ensure solid waste is not stored continuously at site.	Quarry Manager	Ongoing during operations		

9. Environmental management and proposed environmental conditions

Exmouth Quarries and Concrete has established an environmental procedure for the purpose of identifying, accessing and communicating legal and other requirements that are applicable to the quarry operation.
EQC managers will be responsible for ensuring that all staff is appropriately trained on these requirements.
At least annually Exmouth Quarries and Concrete, will review the most current national, regional, state and local legal and other requirements as applicable to quarry operations. In addition, the current list will be reviewed and revised as appropriate, whenever a new requirement that is applicable to the facility is adopted Exmouth Quarries and Concrete acknowledges the environmental protection principles listed in Section 4a of the EP Act

9.1 Regulatory Context

Authorisations, consents and permits
The following table comprises an outline of the, legislation, permits, authorisations and planning required in order managing potential impact risks. The table includes referral to Exmouth Quarries Environmental Management Planning (QEMP) and proposed environmental conditions.

Table 34 Authorisations, Consents and Permits

Factor	Impact	Issue	Requirement	Legislative controls	Agency	Function	Consultative Status	QEMP	Environmental Conditions
Surface water	Drainage management	*Operating in Catchment zone*	*Works Permit* Licence under the RIWI Act	Country Areas Water Supply Act 1947 *Section 12AA* *Section 17 of the RIWI Act 1914* Sewerage & Drainage Act, 1909	*Dept. of Water DEC*	*Relates to operational environmental requirements*	*Permit to interfere with beds and banks - RF 7324*		
	Prevention of surface water contamination	*Operating in Catchment zone*	*Works Permit Operating License*	Environmental Protection Regulations 1998 Environmental Protection Act1986, Part V *(Environmental Regulation)* Dangerous Goods Safety (*Storage and Handling of Non-Explosives*) Regulations 2007	*DEC Dept. of Water DMP*	*Relates to operational environmental requirements as per Environmental Protection Regulations 1998*	*Scoping.*		
Groundwater	Prevention of groundwater contamination	*Operating in Catchment zone*	*Works Permit Operating License*	Dangerous Goods Safety *(Storage and Handling of Non-Explosives*) Regulations 2007	*Dept. of Water DEC Water Corp*	*Relates to operational environmental requirements as per Environmental Protection Act1986, Part V Environmental Regulation*	Previous assessment of clearing permit application April 2006, DoW advised concerns regarding proposal in the previous form.		
	Monitoring of Groundwater	*Operating in Catchment zone*	Licence under the RIWI Act	Country Areas Water Supply Act *1947* *Section 17 of the RIWI Act 1914*	*Dept. of Water Water Corp*	*Relates to operational environmental requirements*	Planning and Access for Water Quality Monitoring Programme utilising Water Corp monitoring bores		
	Protection of significant vegetation	Native Vegetation Clearing	Native Vegetation Clearing Permit CPS	Environmental Protection Act1986, Part V *(Environmental Regulation)*	*DEC DMP(MOA)*	*Relates to operational environmental requirements*	*Scoping.*		

Factor	Impact	Issue	Requirement	Legislative controls	Agency	Function	Consultative Status	QEMP	Environmental Conditions
Rehabilitation	Weed management Feral fauna management Drainage management	Mine closure Planning	Mine Closure Plan - DMP	Soil and Land Conservation Act1945 Environmental Protection Regulations 1987 Conservation and Land Management Act 1984 Mining Act 1978 Mine Safety and Inspection Act 1995	DMP EPA	*Relates to operational rehabilitation requirements*	Planning and Implementation of mitigation works		
Vegetation and flora	Protection of areas outside the footprint prescribed by conditions under Part IV of the EP Act	Native Vegetation Clearing	Native Vegetation Clearing Permit CPS	Environmental Protection *(Clearing of Native Vegetation)* Regulations 2004	DEC/DMP Native	Clearing of to 3.7ha native vegetation for the purpose of mineral production.	*Scoping.*		
	Protection of Declared Rare Flora and Priority flora	Mine Planning and operation	Native Vegetation Clearing Permit CPS	Native Vegetation Regulations 2004 Wildlife Conservation Act 1950	Vegetation Branch DEC/DMP Native	Clearing of to 3.7ha native vegetation for the purpose of mineral production.	*Scoping.*		
Fauna	Protection of areas outside the prescribed footprint conditions under by Part IV of the EP Act	Mine Planning and operation	Native Vegetation Clearing Permit CPS	Environmental Protection *(Clearing of Native Vegetation)* Regulations 2004	Vegetation Branch DEC/DMP Native Vegetation Branch	*Relates to operational environmental requirements*	*Scoping.*		
	Protection of significant habitat	Mine Planning and operation	*Works Permit Operating License*	Wildlife Conservation Act 1950	DEC/DMP Native Vegetation Branch	*Relates to operational environmental requirements*			
	Protection of rare and endangered fauna species	Mine Planning and operation	*Works Permit Operating License*	Endangered Species Protection Act 1992	DEC/DMP Native Vegetation Branch	*Relates to operational environmental requirements*			
Soils and landform	Final Landform	Native Vegetation Clearing	Native Vegetation Clearing Permit	Soil and Land Conservation Act1945 Conservation and Land Management Act 1984	DEC/DMP Native Vegetation Branch	*Relates to operational environmental requirements* *Relates to operational rehabilitation requirements*	*Scoping.*		

Factor	Impact	Issue	Requirement	Legislative controls	Agency	Function	Consultative Status	QEMP	Environmental Conditions
Dust management	Operational dust	Mine Planning and operation	*Works Permit Operating License*	Environmental Protection *(Unauthorised discharges)* Regulations 2004 Environmental Protection Regulations 1987 Mining Act 1978 Mine Safety and Inspection Act 1995	*DEC /DMP*	*Relates to operational environmental requirements*	*Scoping.*		
	Construction Dust	Native Vegetation Clearing	Native Vegetation Clearing Permit CPS	*Environmental Protection (Clearing of Native Vegetation) Regulations 2004* *Wildlife Conservation Act 1950*	DEC/DMP Native Vegetation Branch	*Relates to operational environmental requirements*			
Aboriginal heritage	Protection of Aboriginal heritage sites	Mine Planning and operation		*Aboriginal Heritage Act 1972*		*Relates to operational heritage protection requirements*	Desk top search for Registered sites. Ground survey.		
Noise and vibration	Noise and vibration management	Mine Planning and operation	*Works Permit Operating License*	Environmental Protection Regulations 1987 Environmental Protection *(Unauthorised discharges)* Regulations 2004 Environmental Protection *(Noise)* Regulations 1997		*Relates to operational environmental requirements*	*Scoping.*		

9.2 Proposed conditions

Exmouth Quarries and Concrete are in concord to the option of the EPA, Water Corporation and The Department of Water in the setting of conditions comparable to the condition set for the adjoining quarry operation (Exmouth Limestone). The following conditions are suggested by EQC and are the minimal EQC commitment to the protection and management of both the Exmouth Water supply and the sensitive environment in which it wishes to operate the proposed quarry.

Table 35 Proposed Conditions

Condition	No.	Proposed Condition
Proposal Implementation	**1.1**	The proponent shall implement the proposal as documented and described in this statement subject to the conditions and procedures of this statement.
Proponent Nomination and Contact Details	**2.1**	The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.
	2.2	The proponent shall notify the Chief Executive Officer of the Office of the Environmental Protection Authority of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.
Time Limit of Authorisation	**3.1**	The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.
	3.2	The proponent shall provide the Chief Executive Officer of the Office of the Environmental Protection Authority with written evidence, which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.
Compliance Reporting	**4.1**	The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.
	4.2	The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance report required by condition 4-6, or prior to ground disturbing activities, whichever is sooner. The compliance assessment plan shall indicate: • the frequency of compliance reporting; • the approach and timing of compliance assessments; • the retention of compliance assessments; • the method of reporting of potential non-compliances and corrective actions taken; • the table of contents of compliance assessment reports; and • Public availability of the compliance assessment reports.
	4.3	The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.
	4.4	The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the Chief Executive Officer of the Office of the Environmental Protection Authority.
	4.5	The proponent shall advise the Chief Executive Officer of the Office of the Environmental Protection Authority of any potential non-compliance within seven days of that non-compliance being known.
	4.6	The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance assessment report. The compliance assessment report shall: • be endorsed by the proponent's Chief Executive Officer or a person, approved in writing by the Chief Executive Officer of the Office of the Environmental Protection Authority, delegated to sign on the Chief Executive Officer's behalf; • include a statement as to whether the proponent has complied with the conditions; • identify all potential non-compliances and describe corrective and preventative actions taken; • be made publicly available in accordance with the approved compliance assessment plan; and • Indicate any proposed changes to the compliance assessment plan required by condition 4-1.

Condition	No.	Proposed Condition
Performance Review, Monitoring and Reporting	**5.1**	The proponent shall prepare and maintain a Performance Review Program and submit it to the CEO of the Office of the EPA.
	5.2	The Performance Review Program shall be prepared in consultation with the DoW include: • key performance indicators and targets for key environmental factors • monitoring program to confirm (or otherwise) outcomes for key environmental factors described in the Environmental Protection Statement submitted to EPA • monitoring program to assess the effectiveness of groundwater protection control measures • Results of a rehabilitation-monitoring program.
	5.3	Following the commencement of construction, the proponent shall submit to the CEO of the OEPA a report on the Performance Review Program as a part of the Annual Environmental reports which addresses: • results and trends of monitoring programs described in the Performance Review Program in condition5-2 • achievement (or otherwise) of outcomes predicted in the Project, the success (or otherwise) of mitigation measures in achieving these outcomes and rehabilitation criteria • proposed or implemented changes to mitigation measures to ensure original outcomes are achieved

Condition	No.	Proposed Condition
Groundwater	**6.1**	The proponent shall ensure that runoff from the proposal area, does not cause the quality of groundwater within or adjacent to the proposal area to exceed trigger values established by the proponent on advice from the Office of the Environmental Protection Authority in accordance with ANZECC/ARMCANZ* guidelines. Taking into consideration natural background water quality, protecting existing and potential users, including ecosystem maintenance or affect the groundwater recharge regime. Trigger levels will be approved the by Office of the Environmental Protection Authority prior to commencing. * *Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, Australian Water Quality Guidelines for Fresh and Marine Waters and its updates*.
	6.2	The proponent shall ensure that water quality is consistent with the requirements of the ANZECC/ARMCANZ Drinking water criteria, or take such other in situ measures as are necessary and
	6.3	approved by the Chief Executive Officer of the Office of the Environmental Protection Authority. To verify that the requirements of condition 6-1 are being met the proponent shall: 1. undertake baseline monitoring of the groundwater quality at; and 2. monitor groundwater quality 3 monthly at a minimum at the locations identified and
	6.4	The proponent shall monitor the changes to the hydrological regime, specifically TPH (BTEX), PAH and VOC, the quality and quantity of groundwater within locations determined in consultation with the Department of Water to ensure that requirements of condition 6-1 and 6-2 are met. This monitoring is to be carried out using methods detailed in the Water Quality Management Plan that forms part of The Quarry Environmental Management Plan 1, August 2010 and any subsequent approved revisions, prepared for this Project and to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority. The plan shall include the following: • locations for predicted impact and reference monitoring sites (outside the predicted impact areas) for baseline and ongoing monitoring, with sites selected based on scientific rationale and to the satisfaction of the Department of Water • results of baseline monitoring for both predicted impact and reference monitoring sites and groundwater levels and groundwater quality at agreed sites in proximity to the vegetation monitoring sites; • Specifications for the monitoring program for water quality characteristics, including trigger levels for additional management actions to prevent further impacts and ensure compliance with Condition 6.1. • specific management
	6.5	The proponent shall Liaise with DoW Hydrogeology Section, prior to Commencement of the water quality monitoring in order to collect baseline data with monitoring commencing within one month of ground disturbance.
	6.6	The proponent shall submit annually the results of monitoring required by condition 6.3 to the Chief Executive Officer of the Office of the Environmental Protection Authority. In the event that monitoring required by condition 6.3 indicates that the requirements of conditions 6-1 and 6-2 are not being met: 1. the proponent shall report such findings to the Chief Executive Officer of the Office of the Environmental Protection Authority within 21 days of the decline in water quality standards being identified; 2. the proponent shall provide evidence to the Chief Executive Officer of the Office of the Environmental Protection Authority which allows determination of the cause of the decline in water quality standards; 3. if a decline in water quality standards is determined by the Chief Executive Officer of the Office of the Environmental Protection Authority to be a result of activities undertaken in implementing the proposal, the proponent shall submit actions to be taken to remediate the decline in water quality standards within 21 days of the determination being made to the Chief Executive Officer of the Office of the Environmental Protection Authority. The proponent shall implement the actions to remediate the decline in water quality standards required by condition 6-7(3) upon approval of the Chief Executive Officer of the Office of the Environmental Protection Authority and shall continue to implement such actions until such time the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.
	6.7	The proponent shall make the monitoring reports required by condition 6-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

Condition	No.	Proposed Condition
Rehabilitation	**7.1**	A rehabilitation program shall be prepared in consultation with the DEC, and Department of Mines and Petroleum. This program to be developed prior to the commencement of ground disturbance and shall address rehabilitation procedures, timing, objectives and performance criteria. The proponent shall undertake progressive rehabilitation **during and** towards the end of the proposal to achieve the following outcomes: **1.** areas disturbed through implementation of the proposal, shall be rehabilitated with vegetation composed of native plant species of local provenance, specifically seed or plant material collected the site prior to clearing and within 5 kilometres of the proposal; 2. The percentage cover and species diversity of living self-sustaining native vegetation in all rehabilitation areas shall be comparable to that of the undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority on advice of the **7.2** Department of Environment and Conservation. 3. no new species of weeds, including both declared weeds and environmental weeds, shall establish in the project as a result of the implementation of the proposal; and **7.3** 4. The proponent shall monitor the performance of rehabilitation. **7.4** The proponent will rehabilitate areas disturbed during the Project that are not required for ongoing operations and maintenance. **7.5** Rehabilitation activities shall continue until the requirements of condition 7-1 are demonstrated by inspections and reports to be met for a minimum of five years to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority on advice of the Department of Environment and Conservation. Within five years of the completion of construction, the proponent shall rehabilitate temporarily disturbed areas to meet the following criteria: 1. The percentage cover and species diversity of living self-sustaining native vegetation in all rehabilitation areas shall be comparable to that of undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority; 2. Weed management for the rehabilitation areas shall be carried out as per condition 7.1. 3. Final landform shall be demonstrated to be suitably designed to replicate flow regime and creek line landform to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority on advice from the Department of Environment and Conservation.

10. Conclusion

The key relevant environmental factors identified through process involving the Proponent, and in consultation with State Government Agencies and other stakeholders concerning environmental management, planning and operation of the Project were:

- Protection of the Exmouth Water Supply
- Groundwater Quality - monitoring
- Mine Rehabilitation

10.1 Environmental impacts and management measures

The potential key environmental impacts and the proposed management measures are as follows:

- The proposal intends to increase the size of the mined area to a total 3.7Ha being impacted in the mining operation, this is inclusive of the previously mined area, Laydown and rehabilitation processes areas
- The area required for mining comprises approximately 1.41ha of previously mined rock
- The quarry face will be constructed and move progressively forward with rehabilitation occurring directly behind as the face progresses.
- Groundwater levels will be monitored monthly for the first two years following commencement construction to assess seasonal, natural, groundwater fluctuations with guidance from Dept of Water to ensure regulatory requirements are met before the initiation of the programme.
- The monitoring network will monitor within the Exmouth Water Supply Central Subarea utilising current Production (Water Corp) and non-production bores (EQC).
- Groundwater sampling will be undertaken on a three monthly basis from the allocated groundwater bores for analysis of the parameters: -pH, electrical conductivity (EC), total dissolved solids (TDS), and TPH (BTEX). The groundwater monitoring is undertaken based on the requirements in the National Water Quality Management Strategy No. 7a *AUSTRALIAN GUIDELINES FOR WATER QUALITY MONITORING AND REPORTING, ANZECC & ARMCANZ*
- *A Mining Plan and Quarry Environmental Management Plan* have been developed in consideration of guidelines for Mine Closure and Mine site Rehabilitation guidance material, Legislative requirements and subsequent regulations.
- The restoration of mined areas to a state based on surrounding undisturbed vegetation communities that, are resilient, self-sustaining and where ecosystem processes have been re-established,
- All erosion and sediment controls will be implemented during remediation works and as soon as practicable after clearing and Stage one quarrying operations, including the installation of earth banks around the perimeter of the working area
- The proponent proposes to progressively batter down the created slopes (rehabilitation) through placement of extracted material (overburden remains from previous quarrying) to create a geotechnical stable and safe final landform with a gentle to medium slope consistent with the surrounding topography.
- The use of cut-off drains as well as the containment of dirty (working area runoff) water in a sediment control structure within the operational area of the project to eliminate any potential contamination from uncontrolled runoff.
- Each ephemeral watercourse will be restored and water redirected into the natural channel once rehabilitation of the disturbed area is satisfactorily stable.

10.2 Environmental risks and manageability

Exmouth Quarries and Concrete will minimise environmental risks through the implementation of ongoing management measures. These actions address and contain the following measures;

- Statement of potential impacts of mining operations on each element of the environment.
- A clear environmental performance objective for each element of the environment.
- Dedicated measures to avoid adverse environmental impacts and thus meet performance objectives.
- Identify potential environmental problems and the tools to monitor and solve these problems.
- Compliance with the legislative requirements

This project from initiation has been developed to ensure conformance in regard to the environmentally sensitive nature of the project site based on a risk assessment approach to characterise environmental factors, determine potential impacts and develop mitigation measures.
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WQPN10 *protecting riparian vegetation*
WQPN 11 *Contamination investigations near sensitive water resources*
WQPN 13 *Dewatering of soils*
WQPN 25 *Land use compatibility within public drinking water source areas*
WQPN 27 *Liners for containing pollutants, using engineered soils*
WQPN 39 *Ponds for stabilising organic matter*
WQPN 44 *Roads near sensitive water resources*
WQPN 52 *Stormwater management at industrial sites*
WQPN 56 *Tanks for above ground chemical storage*
WQPN 58 *Tanks for temporary above ground fuel storage*
WQPN 65 *Toxic and hazardous substances - storage and use*
WQPN 70 *Wastewater treatment – onsite domestic systems*
WQPN 84 *Revegetation of disturbed land*
WQPN 12 *the values of the riparian zone* AS 4439 *Wastes, sediments and contaminated soils.*
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WQPN 10 protecting riparian vegetation

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13. Acronyms /Abbreviations

ADWG	Australian Drinking Water Guidelines
AER	Annual Environmental Report
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ANZECC	Australian and New Zealand Environment and Conservation Council
BTEX	Benzene, toluene, ethyl benzene and xylenes. Includes o-, m- and p- xylene isomers
DEC	Department of Environment and Conservation
DMP	Department of Mines and Petroleum
DoW	Department of Water
DRF	Declared Rare Flora
EMS	Environmental Management System (ISO9000:2008)
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPHC	Environment Protection and Heritage Council
EQC	Exmouth Quarries and Concrete
PDWSA	collective description for catchment areas, water reserves or underground water pollution control areas defined and regulated under the *Metropolitan Water Supply Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*
SLIP	Shared Land Information Platform
TENGRAPH	Computer database of graphical and textual mining tenement information
WALGA	Western Australian Local Government Association
WALIS	Western Australian Land Information System
WQPN	Water Quality Protection Notes - Dept of Water

14. Glossary

Analyte
The physical or chemical element or compound, or other parameter to be determined.
Aquifer
A geological unit (i.e. rock or unconsolidated materials) that can store and transmit water in reasonable amounts to water well.
Assessment levels
Guideline concentrations of analytes adopted by DEC to indicate the potential presence of contamination and to trigger requirement for further investigation and assessment of risk at a site.
Base level
The lower limit to the operation of surface erosion processes. Sea level is the overall base level for continents, though an individual channel can have several local base levels defined by bedrock bars, waterfalls or dams.
Bedforms
Features such as ripple marks and sand waves formed by flow over a deformable bed, e.g. stream flow over a sandy riverbed.
Bore/borehole
A hole drilled into an aquifer for the purpose of sampling, monitoring or extracting
Competent person or professional
A person possessing the skills, knowledge, experience, and judgement to perform the assigned tasks or activities satisfactorily.
Contaminant
A substance, which presents or has the potential to present a risk of harm to human health, the environment or any environmental value.
Contaminated
In relation to land, water or a site, means having a substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.
Conceptual site model (CSM)
A description of the site, geology, hydrogeology, sources of
Contamination, receptors and exposure pathways by which the contamination may reach and affect receptors.
Detailed site investigation
An investigation, which confirms and delineates potential or actual contamination through a comprehensive sampling and analysis program and risk assessment.
Drop structure
A terrace structure to transform a steep gradient into a gentle slope in drainage system.
Ecological investigation level (EIL)
The concentration of a substance above which further appropriate investigation and evaluation of risks to the environment or environmental values will be required.
Ecosystem
Unit including a community of organisms, the physical and chemical environment of that community, and all the interactions between those organisms and between the organisms and their environment.
Ecosystem health condition
A condition of the ecosystem, which is:
(a) Relevant to the maintenance of ecological structure, ecological function or ecological process and which requires protection from the effects of emissions or activities (as referred to in (a) and (b) of the definition of environmental harm).
(b) Identified and declared under Section 35(2) of the EP Act to be an ecosystem health condition to be protected under an approved policy.
Endpoint
(a) An observable or measurable biological event used as an indicator of the effect of a chemical and the incidence or severity of the associated adverse effect.
(b) Measured attainment response as applied to management goals.
Environment
Living things and their physical, biological and social surroundings and interactions of all these things.
Environmental harm
Direct or indirect –
(a) harm to the environment involving removal or destruction of, or damage to:
(i) native vegetation; or
(ii) the habitat of native vegetation or indigenous aquatic or terrestrial animals;
(b) alteration of the environment to its detriment or degradation or potential detriment or degradation;
(c) alteration of the environment to the detriment or potential detriment of an environmental value; or
(d) alteration of the environment of a prescribed kind as specified in the EP Act.
Environmental health
Those aspects of human health determined by physical, biological and social factors in the environment (also see ecosystem health condition).
Exposure pathway
The course a chemical or physical agent takes from a source to a receptor. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at a site or originating from a site. Each exposure pathway includes a source or release from a source, an exposure point and an exposure route.
Fate
Disposition of a substance in various environmental media (e.g. soil, sediment, water and air) as a result of transport, transformation and degradation.
Gabion
A metal basket filled with rocks used for erosion control on the edges or banks of waterways.
Geomorphic
Of, or relating to, the forms of the earth's surface and the processes associated with them (e.g. erosion, weathering, transport and deposition). Fluvial geomorphology relates to river form and process. All waters occurring below the land surface.

Hazard
The capacity of an agent to produce a particular type of adverse health or environmental effect.
Hydraulic gradient
The change in the static head (of groundwater) per unit distance in a given direction.
Hydrogeology
The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.
Investigation levels
The concentration of a contaminant above which further investigation and risk assessment will be required.
Landfill
A site used for disposal of solid material by burial in the ground that is licensed as a landfill under the EP Act.
Licence
Licence granted and in force under Part V of the *Environmental Protection Act 1986*.
Limit/level of detection
The minimum concentration or mass of analyte that can be detected at a known confidence level.
Limit/level of reporting
the lowest detectable concentration of a substance that can be reliably reported, using a specific laboratory method and instrument (also Practical Quantitation Limit). The value is calculated from the instrument detection limits and with appropriate scale-up factors applied.
Permeability
The capacity of a porous rock, sediment or soil for transmitting a fluid when subjected to unequal pressure.
Point source
Localised source of contamination such as leaking storage tanks and drums.
Porosity
The percentage of the bulk volume of a rock or soil that is occupied by interstices, whether isolated or connected.
Potable water
Water suitable from both health and aesthetic considerations, for drinking and culinary purposes.
Practicable
Means having regarded to, amongst other things, local conditions and circumstances (including costs) and to the current state of technical knowledge.
Practitioners
Suitably qualified professionals with experience in environmental investigations and contaminated site management.
Preliminary site investigation (PSI)
An investigation consisting of a desktop study, a detailed site inspection and, where appropriate, limited sampling. The scope of a preliminary site investigation should be as necessary to determine whether contamination is present or likely to be present and to determine whether a detailed site investigation is required.
Quality assurance (QA)
The implementation of checks on the success of quality control
Receptor
An entity, such as a person or ecosystem, which potentially may be adversely affected by exposure to a contaminant.
Rehabilitation
The restoration of disturbed land to the condition that applied prior to development of the site or as agreed with regulatory authorities.
Remediation
In general, means action taken to eliminate, limit, correct, counteract, mitigate or remove any contaminant or the negative effects of the contaminant on the environment
With respect to the CS Act and a site that is contaminated, remediation includes:
(a) the attempted restoration of the site to the state it was in before the contamination occurred
(b) the restriction, or prohibition, of access to, or use of, the site
(c) the removal, destruction, reduction, containment or dispersal of the substance causing the contamination, or the reduction or mitigation of the effect of the substance
(d) the protection of human health, the environmental or any environmental value from the contamination.
Riprap
Rocks of varying sizes placed on the edge or bank of a waterway as erosion control.
Risk
Means the probability in a certain timeframe that an adverse outcome will occur in a population and/or ecosystem of a specified area.
Risk assessment
Process of estimating the potential impact of a chemical, biological or physical agent on a specified human population or ecological system under specified conditions and timeframe.
Risk communication
An interactive process involving the exchange among individuals groups and institutions of information and expert opinion about the nature, severity and acceptability of risks and the decisions taken to combat them.,
Risk management
The process of evaluating alternative actions, selecting options and implementing them in response to risk assessments. The decision-making will incorporate scientific, technological, social, and economic information. The process requires value judgments.
Sediment
Unconsolidated particles of sand, clay, silt and other substances that settle at the bottom of a body of water.
Site
An area of land including underground water under that land and surface water on that land.
Stygofauna
Subterranean aquatic fauna.
Threshold concentration
The lowest concentration above which some effect (or response) will be produced
Uncertainty
The lack of knowledge about the correct value e.g. a specific exposure measure or estimate.

Validation
The process of demonstrating that a site has been remediated successfully. Involves the collection and analysis of samples to demonstrate that contaminant concentrations are below acceptable limits and do not pose a risk to human health, the environment or environmental values.
Watertable
The surface of an unconfined aquifer or confining bed at which the pore water pressure is equal to atmospheric pressure. It can be measured by installing piezometers or groundwater bores into the zone of saturation and measuring the water level in those bores.
Well
Refer to bore.
Quality control (QC)
The implementation of procedures to maximise the integrity of monitoring data (e.g. cleaning procedures, contamination avoidance, sample preservation methods.

15. List of Appendices

M08/06 SL 3H/034 Proposed Clearing Area Flora and Fauna Assessment
Feature and Level Assessment (CAVES AND FISSURES)
Technical Data Spill Containment