



STRATEGEN
environmental consultants

Nickol Bay Quarry

Environmental Management Plan

Prepared for
Holcim
by Strategen

March 2012

Nickol Bay Quarry

Environmental Management Plan

**M47/26, M47/255, M47/306, M47/309, M47/331,
M47/333, M47/353, G47/23, G47/42, G47/47,
G47/48, G47/171, L47/91**

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March 2012

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Client: Holcim

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Part A Project information

1. Introduction

1.1 Background

Holcim Australia (Holcim) own and operate the Nickol Bay hard rock quarry located on the Burrup Peninsula, between Dampier and Karratha in the Pilbara region of Western Australia (

Figure 1). The quarry was established in the 1960s by Hamersley Iron, and ceased operations for a period in the 1980s before being acquired by Readymix and CEMEX, and is now owned by Holcim.

The quarry supplies granite products to the Pilbara region for road, rail and infrastructure projects. The primary uses of hard rock mined from the quarry are for aggregate for concrete for use in residential and commercial construction. The quarry also supplies rock for the purposes of road (base course) and rail (ballast) construction, armour rock and drainage aggregate.

Tenements currently held by Holcim include Mining Leases M 47/26, M47/255, M47/306, M47/309, M47/331, M47/333, and M47/353. Holcim also holds General Purpose Leases G47/23, G47/42, G47/47, G47/48, G47/171, and Miscellaneous Lease L47/91 (Figure 2).

Two expansions to the quarry have been issued Statements pursuant to Part IV of the *Environmental Protection Act 1986*. Neither of these expansions have occurred.

A proposal for the Eastern Expansion involving Mining leases M47/306, M47/309, M47/331 and M47/353 was submitted to the Environmental Protection Authority (EPA) in 1996. The EPA recommended that the proposal can meet its environmental objectives in Bulletin 834 (1996), and the Minister for the Environment issued Statement 440 on 14 February 1997.

The Western Extension proposal was referred to the EPA in 2002, which proposed to extend the quarry westwards over granted mining lease M47/333. The project was subject to a comprehensive assessment process, resulting in the EPA recommending that the proposal may be implemented subject to a number of conditions in Bulletin 1170 (2005). Statement 713 for the extension was issued by the Minister on 31 January 2006 and superseding previous Statement 440.

1.2 The proponent

The Proponent for the Nickol bay Quarry is Holcim Australia Pty Ltd (formerly CEMEX Australia), trading as Holcim. Holcim is an international buildings materials company with a long history of operations in Australia. The company provides premixed concrete, aggregates, gravel and sand to the construction industry and has been operating in Australia since 1939.

1.3 Purpose and scope

This Environmental Management Plan (EMP) is a revised and updated version of the Nickol Quarry EMP 2005 (ATA 2005). The EMP has been prepared to satisfy condition 6-1 and 7-1 of Statement 713 (Appendix 1), and all current applicable legislative, environmental, tenement, national heritage and cultural heritage requirements for the Nickol Bay Quarry operations. Components of the original EMP that are still applicable to the project have been included in this document.

The purpose of this EMP is to provide a practical working document to be used on site by designated personnel as a reference resource, and includes basic protocols and management procedures for auditing, conservation areas, rehabilitation and decommissioning.

The plan has been designed to ensure that all relevant environmental factors relating to the operations have been identified and are managed according to best environmental practice.

These environmental factors generally relate to ground disturbing activities and the impact of these activities on the local environment.

The EMP addresses existing and proposed activities at the Nickol Bay Quarry, including the operational main quarry and the approved Eastern and Western Extensions. It considers only activities associated with operational phases as the project is already operational under licences issued by the DEC and DMP.

The legislative requirements for the project are outlined in Section 1.5. The activities of any person employed by, or company sub-contracted to Holcim in any way, are covered by this EMP. All sub-contract procurement documentation shall include any specific environmental management control requirements, as detailed in this EMP and deemed applicable to the service being provided.

This EMP should be read in conjunction with the following documents:

- *Public Environmental Review for Western Extension to Nickol Bay Quarry (ML47/333), Burrup Peninsula, Dampier, Martinick McNulty Pty Ltd, July 2002.*
- *EPA Bulletin 1170: Western Extension to Nickol Bay Quarry – Readymix Holdings Pty Ltd: Report and recommendations of the Environmental Protection Authority. May 2005.*
- *Ministerial Statement 713: Hard Rock Quarry, Burrup Peninsula. Assessment no 1377. Minister for the Environment, Western Australia. January 2006.*
- *Holcim SHE Management System documentation and guidelines.*
- *Mining Development Proposal, Nickol Bay Environmental Management Plan 47/26 and 47/255, August 1991.*
- *Shire of Roebourne Mining Leases M47/306 and M47/331 and Mining Lease Application M47/353: Consultative Environmental Review for Hard-Rock Quarrying Burrup Peninsula, W G Martinick and Associates, November 1994.*
- *Shire of Roebourne Mining Leases M47/306 and M47/331 and Mining Lease Application M47/353: Supplement to Consultative Environmental Review for Hard-Rock Quarrying Burrup Peninsula, November 1994, W G Martinick and Associates, February 1996.*

These documents contain more detailed descriptions of the environment, additional background information, and details of management tools.

This EMP is consistent the ISO14000 series of environmental standards, which enables proactive control of risk across the whole life-cycle of an organisation's projects and provides opportunities for continuous improvement in environmental performance.

1.3.1 Related plans and programs in preparation

In addition to this EMP, under the requirements of Ministerial Statement 713, the proponent is required to prepare the following plans and programs:

- Compliance Audit Program (Appendix 5)
- Conservation Area Management Plan

- Progressive Rehabilitation Program
- Final Rehabilitation and Decommissioning Plan.

General management actions to protect the conservation areas adjacent to the quarry areas are included in this EMP (Section 5). Once comprehensive surveys have been completed more specific management actions for these areas will be developed and incorporated into this EMP.

A Progressive Rehabilitation and Decommissioning Plan will be developed prior to commencement of operations in the “Western Extension”. A Preliminary Rehabilitation Management Plan has been included in this EMP (Section 14) and contains basic rehabilitation management protocols to provide for management while the detailed Rehabilitation Programme is in development. The Final Rehabilitation and Decommissioning Plan may not be developed for some time as the life of the quarry is estimated to be approximately 10 years.

A Cultural Heritage Management Plan is being prepared, recognising the cultural and archaeological significance of the Burrup Peninsula, and the quarry site. The Plan will include cultural heritage protocols, site procedures, communication strategies, and risk minimisation.

A Blast Impact Assessment has been undertaken to identify potential impacts of blasting on conservation areas and cultural heritage sites, with regard to vibration, wall stability and fly rock. A copy of the Assessment and explanatory notes is provided as Appendix 8. A Blast Management Plan has also been prepared based on the outcomes of the Impact Assessment. The Management Plan outlines the operational requirements such as stemming height and front row burden standards that must be met during blast design and hole loading to prevent potential impacts on areas of significance. The Management Plan is provided as Appendix 9.

1.4 Structure of the EMP

This EMP is structured as follows:

Part 1 provides an introduction and background information to the Nickol Bay Quarry project, including the geographic, environmental, and social setting, and the requirements and purpose of the EMP.

Part 2 presents the discrete management plans that comprise the overall EMP. Each plan addresses the management of environmental aspects for a particular environmental factor. Plans have been prepared in accordance with the Department of Environment and Conservation (DEC) guidelines.

The structure of each plan is as follows:

- description of factor
- relevant environmental aspects requiring mitigation or management
- environmental performance objectives
- implementation strategy

- management actions required to achieve the environmental objectives, including details of the timing and persons responsible for implementation
- contingency actions to be implemented in the event of unacceptable environmental outcomes
- monitoring and reporting procedures.

Part 3 provides an explanation of the Holcim Management Framework and the Environmental Management System and provides an explanation of the management protocols and procedures that support the management plans, and how the EMS works as a whole, including:

- communication and training
- stakeholder consultation
- performance reporting and auditing
- review and revision.

1.5 Relevant legislation and policy

1.5.1 Project-specific requirements

This EMP has been prepared to address the conditions 6-1 and 7-1 and commitments of Statement 713 (Appendix 1). The key environmental factors addressed in this EMP (as specified in condition 6-1) are as follows:

1. Declared rare and priority flora and vegetation communities.
2. Threatened and priority fauna.
3. Visual amenity - Management of operations to reduce visual impact.
4. Aboriginal heritage.
5. Noise management.
6. Dust management.
7. Control of weeds and introduced animal species.
8. Management of fuels and oils.
9. Surface water.
10. Conceptual closure plan.

A stand alone Blast Management Plan, is provided as Appendix 9.

Table 1 provides the management commitments listed in Schedule 2 of Statement 713.

Development of this EMP was guided by advice from DEC (26 June 2009), and the objectives of the plan are consistent with EPA Report 1170 (previously known as EPA Bulletin 1170). The EMP adheres to the Tenement conditions provided in Appendix 2.

Where relevant, environmental management objectives and actions have been informed by Holcim Environmental Standards for Hard Rock Quarries (SHE Guideline 4.2.2A (1)).

Table 1 Environmental Management Commitments – Statement 713 (Schedule 2)

No	Commitment	Objective	Timing	Advice
FUTURE EXPANSION				
1	Withdraw areas shown in figure 3 of schedule 1 from potential future quarrying plans	To retain these areas for vegetation conservation*	Prior to commencement of mining western extension	
VISUAL AMENITY				
2	Rehabilitate the upper bench of the south-facing quarry slopes which are visible from the plain by: <ol style="list-style-type: none"> 1. Reducing the finished visible faces to a maximum 1:1 slope 2. Covering the reduced slopes with reddish brown coloured rocks and surface material 3. Encouraging establishment of vegetation (mainly <i>Triodia</i> (Spinifex) species). 4. Seeding areas with local seed if recolonisation is not progressing adequately within 18 months 5. Meeting with the Department of Conservation and Land Management (now DEC) annually for five years to assess rehabilitation progress and options 	To reduce the visual impact of the western quarry extension	During operation of the quarry	Department of Conservation and Land Management
3	Construct the southern part of the quarry safety bund to heights of up to 2.5 metres	To reduce the extent of the quarry faces visible from the plain	During operation of the quarry	
4	Construct part of the visible part of the quarry safety bund with reddish brown coloured rocks and surface material	To blend in with the existing landscape	During operation of the quarry	
5	Review the feasibility of relocating existing plant and stockpiles to within the quarry put, and relocate plant/stockpiles if practicable	To reduce visual impact of the quarry	Annually	
REHABILITATION AND DECOMMISSIONING				
6	Develop a detailed Rehabilitation and Decommissioning Plan (See condition 8 and 9)	To progressively rehabilitate and decommission the quarry to a standard consistent with the long-term land use	Within three years following approval for the western extension, or prior to commencement of the western extension, whichever is the sooner	Shire of Roebourne, Department of Industry and Resources
7	Implement the Rehabilitation and Decommissioning Plan referred to in commitment 6	To achieve the objectives of the decommissioning plan	During and post-operation	Department of Industry and Resources
CLEARING OF VEGETATION				
8	Restrict clearing of vegetation to a practical minimum	To minimise vegetation disturbance	During operation of the quarry	

* these areas are also National Heritage Listed areas under the EPBC Act 1999 – see Figure 2

The operations on the quarry site result in the site being defined as a ‘Prescribed Premises’ under the provisions of Part V of the Environmental Protection Act, 1986. The quarry currently operates under the premise licence No. 4741/1982/11 (Appendix 7).

Water supply is sourced from existing quarry sumps used to harvest rainwater and runoff, supplemented by scheme water as required. Accordingly, no groundwater extraction bores exist which require licensing under the *Rights in Water and Irrigation Act 1914*.

Storage of dangerous goods and explosives is in accordance with the safety requirements of the Storage and Handling Regulations Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007.

1.5.2 Applicable legislation

Holcim must comply with all relevant environmental legislation, regulations, Australian Standards, Codes of Practice and Treaties administered by other State and Federal Government agencies. The Holcim Safety Health and Environment (SHE) Guideline 4.1 – Permits, Licences and Approvals will apply to ensure that applicable regulatory requirements are being complied with, and updated as required to ensure that the latest applicable versions are readily accessible.

Western Australian legislation and Regulations relevant to the project includes the following:

- *Aboriginal Heritage Act 1972*
- *Bush Fires Act 1954*
- *Conservation and Land Management Act 1984*
- *Environmental Protection Act 1986*
- Environmental Protection (Noise) Regulations 1997
- *Dangerous Goods Safety Act 2004*
- *Heritage of Western Australia Act 1990*
- *Land Administration Act 1997*
- *Local Government Act 1995*
- *Occupational Safety and Health Act 1984*
- *Planning and Development Act 2005*
- *Wildlife Conservation Act 1950.*

Commonwealth legislation relevant to the project includes the following:

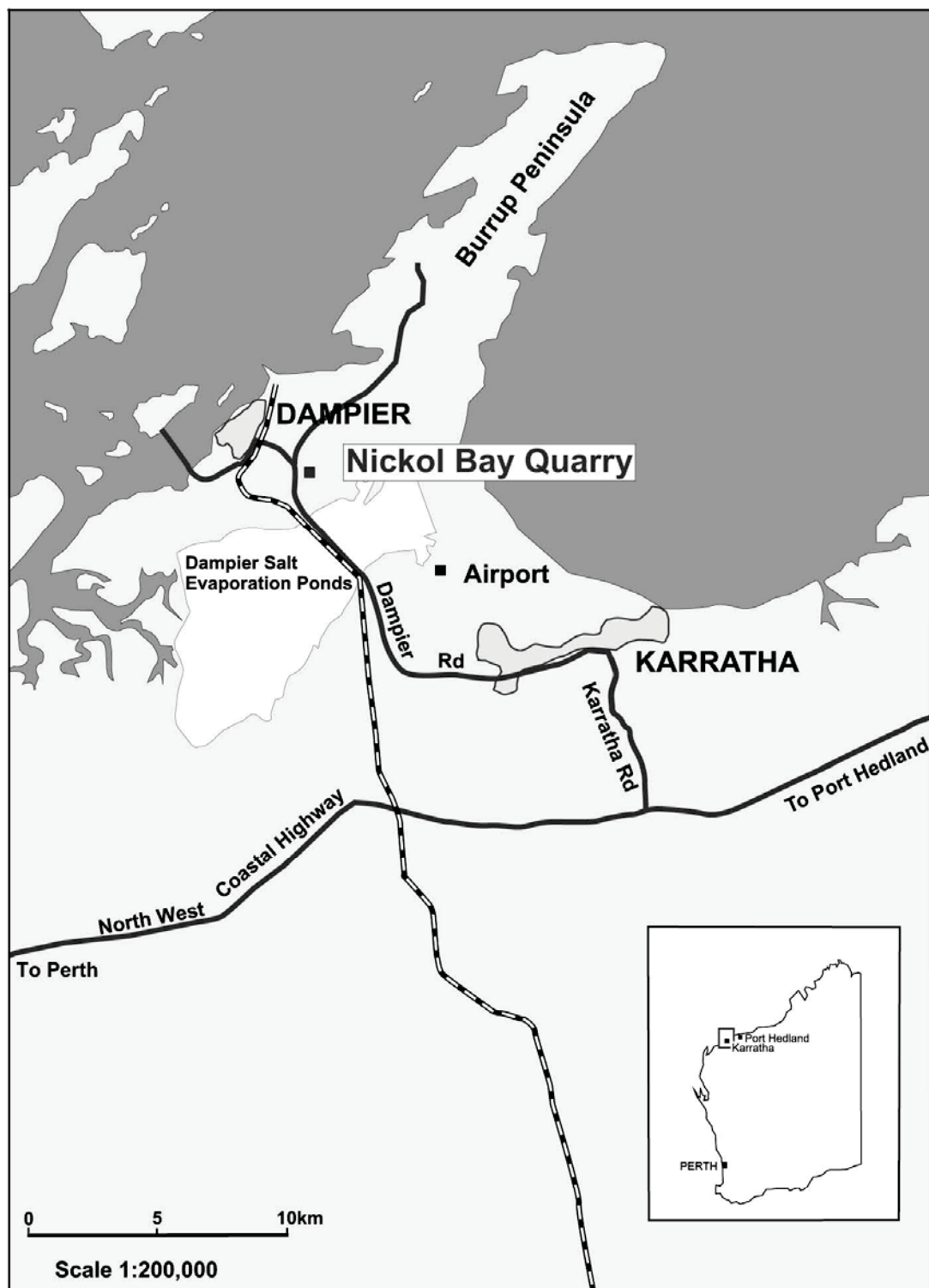
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (which operates concurrently with any existing State laws in so far as those laws would not be consistent with this Act)
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Native Title Act 1993.*

Checked: PJ 11/11/05

Drawn: 10/11/05

Datum: Not Applicable

RAU-2005-001: 2005/197



Source: EPA Bulletin 1170 (2005)

Figure 1 Regional Location of Nickol Bay Quarry



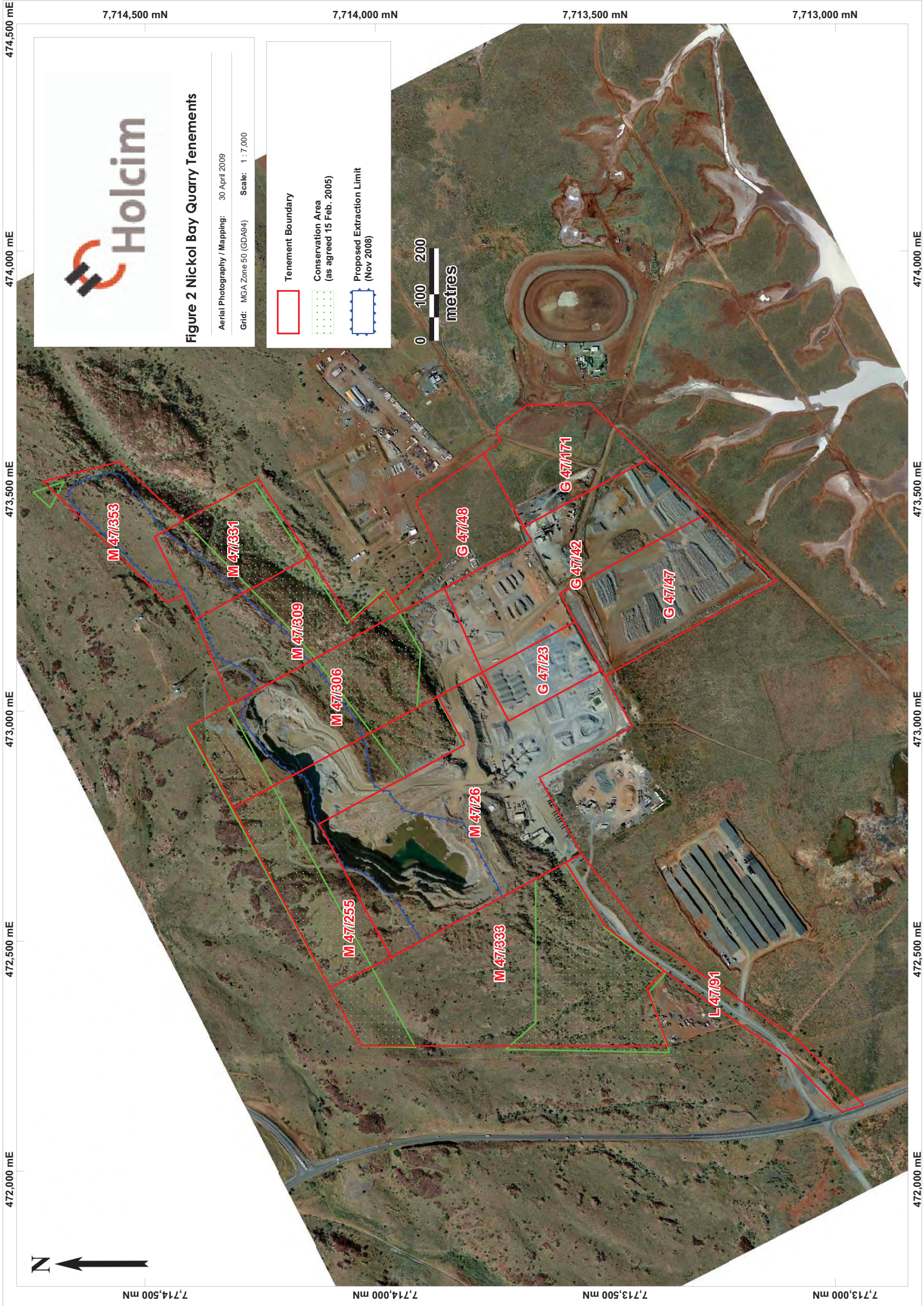
Figure 2 Nickol Bay Quarry Tenements

Aerial Photography / Mapping: 30 April 2009

Grid: MGA Zone 50 (GDA94) Scale: 1 : 7,000

- Tenement Boundary
- Conservation Area (as agreed 15 Feb. 2005)
- Proposed Extraction Limit (Nov 2008)

0 100 200 metres



7,714,500 mN

7,714,000 mN

7,713,500 mN

7,713,000 mN

474,500 mE

474,000 mE

473,500 mE

473,000 mE

472,500 mE

472,000 mE

474,000 mE

473,500 mE

473,000 mE

472,500 mE

472,000 mE

7,714,500 mN

7,714,000 mN

7,713,500 mN

7,713,000 mN

2. Project description and the local environment

2.1 Environmental setting

2.1.1 Physical environment

The Nickol Bay Quarry is located at the southern end of the Burrup Peninsula, in the Pilbara region of Western Australia. The region is semi-desert tropical, and is often described as bi-seasonal, with a long moderate dry winter season from May to November, and a short, hot, wet summer season from December to March. The annual rainfall is approximately 260 mm, and tropical cyclones are common in summer.

The Burrup Peninsula is predominantly comprised of weathered outcrops and ranges of fractured red/brown rock with scree slopes dominating the landscape (DEC 2006). Faulting and jointing affects most of the rocks, and weathering has produced a variable overburden of decomposed rock. Soils are generally sparse in the rocky terrain, and are shallow reddish brown loam.

Nickol Bay Quarry is located between the Pistol Ranges immediately to the north and the Dampier salt evaporation ponds approximately one kilometre to the south, which were originally tidal flats separating the Burrup Peninsula from the mainland.

The Mining Tenements where the quarrying activities are currently active, and the proposed western and eastern extensions, are located on the scree slope of the Pistol Range, which contains some of the characteristic rockpiles of the Burrup Peninsula. The General Purpose Leases to the south are of lower elevation and more gentle slopes. These areas are less rocky than the quarrying areas, and contain more soil.

There are no defined ephemeral watercourses in the vicinity of the project area. The water table in the quarry is about 2 metres below the quarry base (4m AHD), as confirmed by blast hole groundwater level measurements. As groundwater beneath the site is located below the level of existing and proposed quarries the quarry pit does not require dewatering.

2.1.2 Biological environment

The Burrup Peninsula is located within the Fortescue Botanical District (Beard, 1975). Flora of the Burrup Peninsula are characterised by species diversity and richness, and a large number of vegetation associations. Patterns of floristic units are correlated with landscape groups, such as rockpiles, slopes and drainage lines (Trudgen 2002). The dominant vegetation type within the area of the quarry is hummock grasslands dominated by *Triodia* species (Spinifex), with mixed open scrub and open low woodland, punctuated by habitat and substrate related minor communities.

Because the Peninsula has a complex and diverse topography containing a wide variety of habitat types, it supports a diverse fauna. Native fauna of the Burrup Peninsula has been estimated to include 14 species of ground mammals, 14 bat species, 58 reptile species, 2 frog species, as well as birds, including migratory and wetland birds species (DEC 2006). Three species protected under the EPBC Act have been identified as possibly occurring in the area. Details of protected species can be found in Section 4.1.

2.1.3 Social environment

The mainstay of the Pilbara economy is mining and petroleum industries, with other major industries including pastoral operations, tourism and fishing. Nickol Bay Quarry is located within the Shire of Roebourne. The closest town is Dampier, which is several kilometres to the north-west of the quarry, and is shielded from the quarry by the Pistol Range. Karratha is approximately nine kilometres to the south-east of the quarry.

Non-indigenous land use in the area surrounding the quarry includes a pistol and rifle range to the east, a speedway to the south-east, and a concrete batching plant to the south-west. The area to the north of the quarry is zoned recreation, conservation and heritage.

The Burrup Peninsula has high cultural heritage value and includes a diverse range of Aboriginal sites of significance, and a high concentration of cultural heritage sites. In 2007 the Dampier Archipelago (including the Burrup Peninsula) was listed as a National Heritage Place under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), in recognition of its unique cultural heritage. The Burrup is best known for petroglyphs, or ancient rock carvings.

Several Aboriginal heritage surveys of the Nickol Bay Quarry site have been commissioned over the years and have included liaison with representatives from local indigenous groups. Several Aboriginal sites have been identified within Holcim tenements. Further details of surveys and sites can be found in section 7.1 of the Aboriginal Heritage Management Plan within this EMP.

2.2 Infrastructure and operations

The existing quarry pit and proposed quarry areas (western and eastern extensions) occupy an area of approximately 25 hectares, and were established in accordance with DMP requirements, with benches up to 20 m high and 10 – 20 m wide depending on the reserve and on local constraints. The maximum depth of the quarries is 60 m below ground level (RL04 AHD).

The current quarry pit is located within tenements M47/26, 255 and 306. The quarry will, in the future, extend to the east into tenements M47/309, 331 and 353 and the west into M47/333 (Figure 3). General Purpose Leases (G47/23, 42, 47, 48, 171 and L47/91) are used for quarry infrastructure (i.e. plant, equipment, amenities etc) and stockpiling of material.

Holcim was consulted regarding the conservation of land on their tenements, as some areas have been deemed to have high environmental and cultural significance. Negotiations with the Department of Environment (now DEC), Environmental Protection Authority (EPA) and the Department of Industry and Resources (now Department of Mines and Petroleum - DMP) resulted in an agreement to withdraw certain areas from future quarrying plans and manage these areas for conservation. The General Purpose Leases, the Miscellaneous Lease, and the entire working area of the quarry including extensions, are not part of these agreed conservation areas.

G47/42 contains an asphalt manufacturing plant owned by Works Infrastructure (part of Downer EDI). This asphalt plant operates under DEC Category 35 Licence L7915/2004/3 and in accordance with the Downer EDI Works - Karratha Asphalt Plant Environmental Management Plan (May 2009).

There are also sub-contractors that operate at the facility. West Australian limestone has a contract to undertake drill and blast activities at the Quarry. All subcontractors are required to comply with the requirements of the Nickol Bay Quarry EMP.

Infrastructure

Key infrastructure components of the Holcim project are as follows, with locations shown in Figure 4:

- product stockpiles
- Run of Mine (ROM) Pad
- Primary, Secondary, Tertiary and Quaternary Crushers
- screening plant, including sorting screen
- laydown/salvage yard
- waste facilities
- administration block
- site laboratory
- workshop
- weighbridge
- diesel fuel storage area
- washdown bay
- septic tanks
- silt pond and washed fines
- conveyors.

Operations

In-pit operations consist of drilling and blasting of hard rock followed by excavation and loading of rock onto haul trucks. Drill and blast activities are sub-contracted to MAXAM Australia Pty Ltd (MAXAM) on an as needs basis, but generally blasting occurs up to twice a week depending on product demands. Drill and blast contractors supply explosives (ANFO) as needed.

Haul trucks utilise designated haul roads to transport rock material to the crusher pad. Rock is dumped into a hopper and fed through the primary and secondary crusher. Dust generated by plant equipment is controlled via a dedicated exhaust system and water sprays which are manually initiated. Depending on the product specifications, the rock undergoes a series of crushing and screening steps and is then stockpiled prior to despatch via road trucks.

Water supply for dust suppression is sourced from a combination of harvested runoff contained within in-pit sumps and from scheme water. Domestic and potable water is sourced from the scheme water supply. Total site water demand is estimated to be approximately 120ML/year depending on dust suppression and processing requirements during crushing.

The existing facilities at the Nickol Bay Quarry employ fifteen permanent staff plus a number of casual staff. The quarry operates 24 hours a day, 7 days a week, with some activities limited to daylight only.

The project life is expected to be in the order of 10 years given the estimate of the quarry reserve, and quarrying rate of approximately to 1 Mtpa. The exact project life is dependent upon the nature and scale of developments in the region and resultant product demand.

Access to the quarry is from the Karratha-Dampier Road and the sealed main entrance road situated on L47/91.

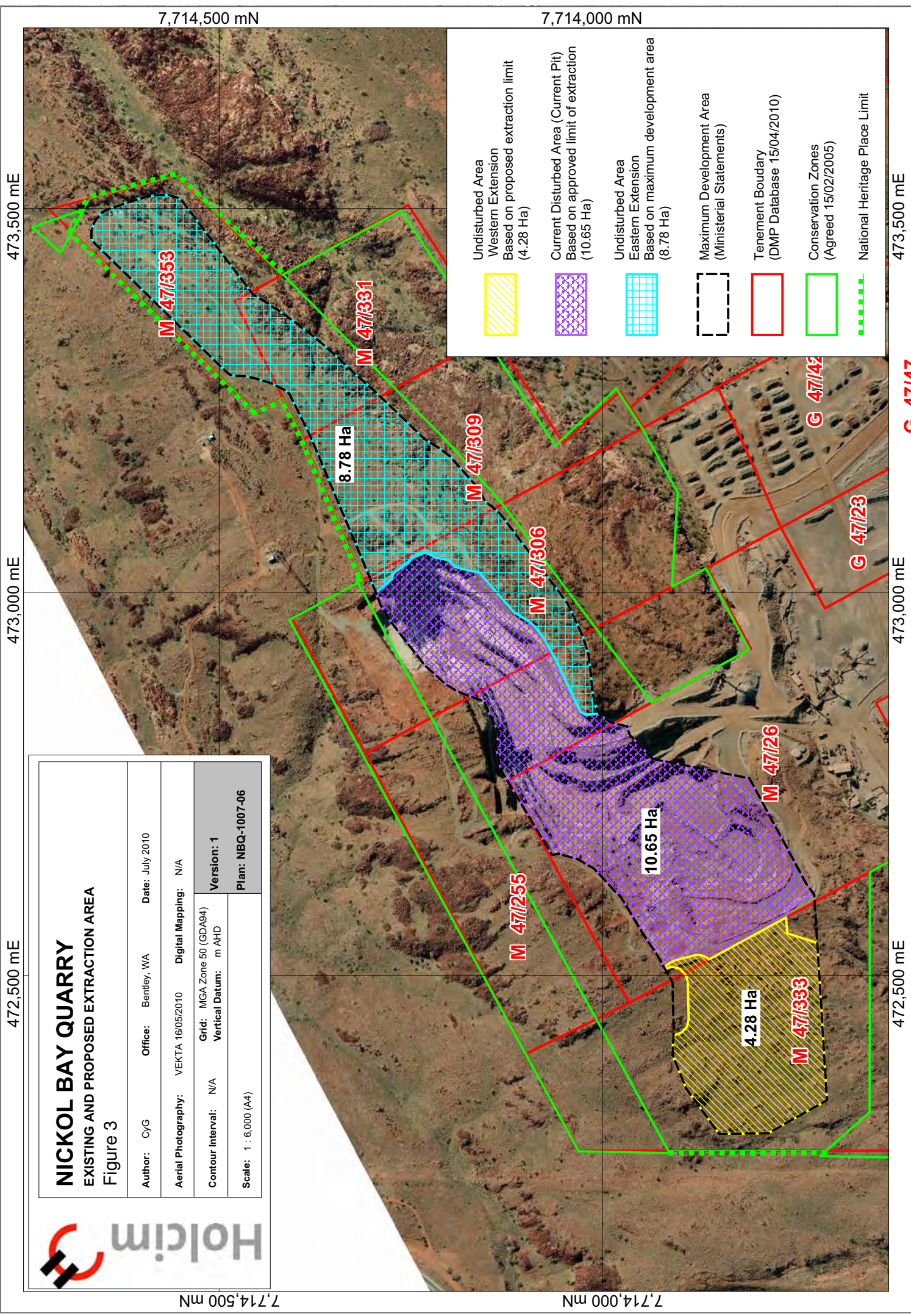


NICKOL BAY QUARRY

EXISTING AND PROPOSED EXTRACTION AREA

Figure 3

Author: CyG	Office: Bentley, WA	Date: July 2010
Aerial Photography: VEKTA 16/05/2010	Digital Mapping: N/A	Version: 1
Contour Interval: N/A	Grid: MGA Zone 50 (GDA94)	Plan: NBQ-1007-06
Vertical Datum: m AHD	Scale: 1 : 6,000 (A4)	



	Undisturbed Area Western Extension Based on proposed extraction limit (4.28 Ha)
	Current Disturbed Area (Current Pit) Based on approved limit of extraction (10.65 Ha)
	Undisturbed Area Eastern Extension Based on maximum development area (8.78 Ha)
	Maximum Development Area (Ministerial Statements)
	Tenement Boundary (DMP Database 15/04/2010)
	Conservation Zones (Agreed 15/02/2005)
	National Heritage Place Limit

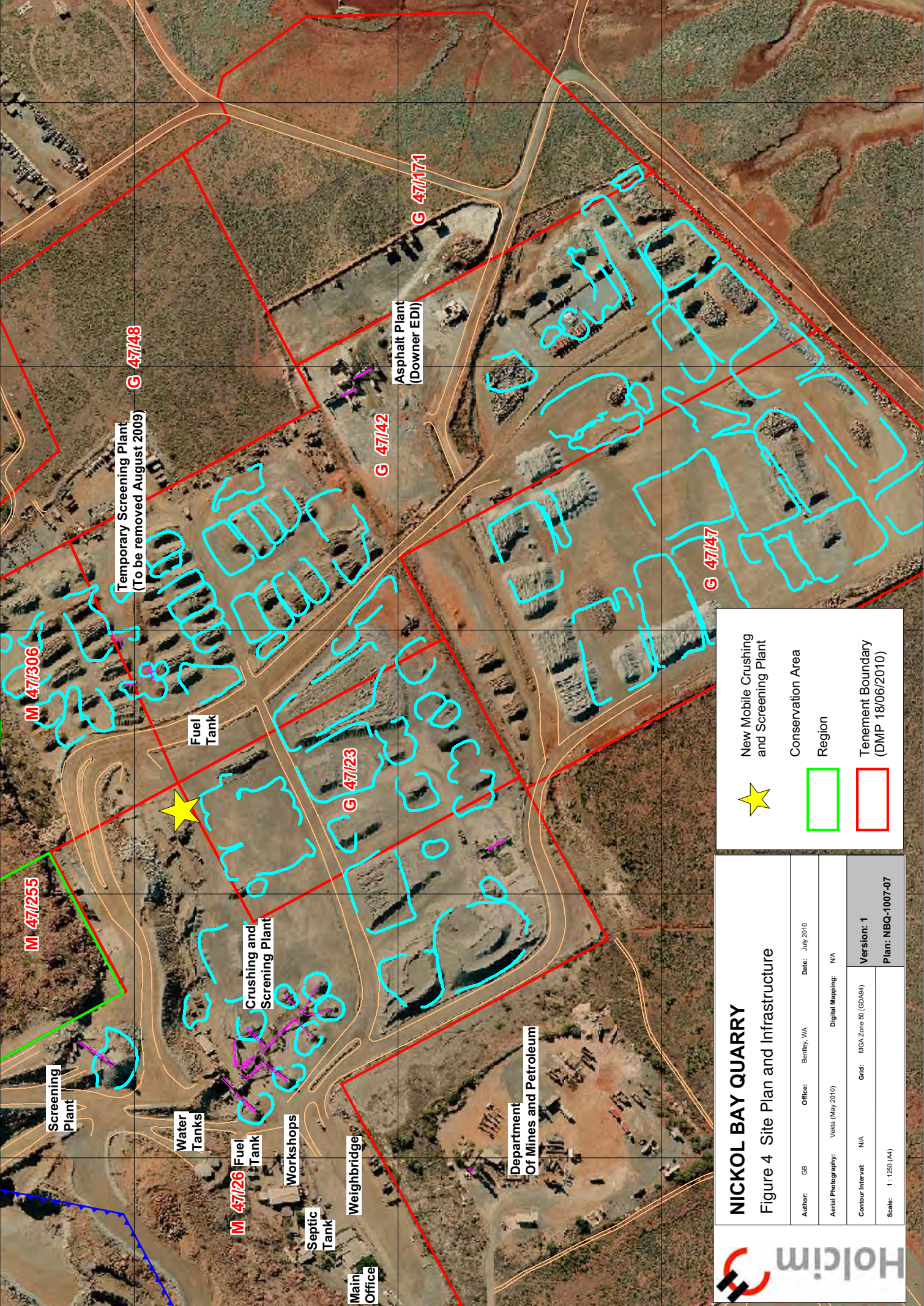
7,713,800 mN

7,713,600 mN

7,713,400 mN

473,600 mE
473,400 mE
473,200 mE
473,000 mE
472,800 mE

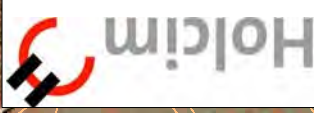
473,600 mE
473,400 mE
473,200 mE
473,000 mE
472,800 mE



Legend

- New Mobile Crushing and Screening Plant
- Conservation Area
- Region
- Tenement Boundary (DMP 18/06/2010)

NICKOL BAY QUARRY	
Figure 4 Site Plan and Infrastructure	
Author: GB	Office: Bentley, WA
Date: July 2010	Digital Mapping: N/A
Aerial Photography: Velde (May 2010)	Grid: MGA Zone 56 (GD0484)
Contour Interval: N/A	Scale: 1 : 1250 (A4)
Version: 1	Plan: NBQ-1007-07



472,800 mE

7,713,800 mN

7,713,600 mN

7,713,400 mN

472,800 mE

Part B Management plans

3. Flora and Vegetation Management Plan

3.1 Description

The vegetation of the Burrup Peninsula is closely related to landscape type. The existing and proposed quarry areas are generally located on scree slopes, which are dominated by *Triodia* species (spinifex).

There are currently no known Declared Rare Flora (DRF) on the Burrup Peninsula, or in adjacent areas (Florabase 2009). Two Priority species have the potential to occur in the project area, *Terminalia supranitifolia* (Priority 3), and *Gymnanthera cunninghamii* (Priority 3) (Florabase 2009). Priority 3 flora species are defined as Poorly Known taxa which are known from several populations, at least some of which are not believed to be under immediate threat (DEC, 2008).

T. supranitifolia has a geographically restricted distribution that consists of several disjunct subpopulations that suggests the species was previously widespread. *G. cunninghamii* is quite uncommon in the Fortescue Botanical District, although it is widespread in other parts of the State and in the Northern Territory and Queensland.

In addition to these Priority species, some Priority Ecological Communities (PECs) also occur on the Burrup Peninsula. These include the Burrup Peninsula rock pile communities, Roebourne Plains coastal grasslands, and Stony Chenopod association of the Roebourne Plains area. These three community types are all Priority 1 PECs, defined as poorly-known ecological communities, with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist (DEC 2008). There are no Threatened Ecological Communities (TECs) in the area.

Further details of the flora and vegetation of the Nickol Bay Quarry and surrounds can be found in the Public Environmental Review (Martinick McNulty 2002).

3.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management to ensure protection of vegetation and habitat values:

- clearing of vegetation
- human and vehicle activity
- dust generation
- weed spread.

3.3 Environmental performance objectives

This Flora and Vegetation Management Plan has been prepared to minimise impact of ongoing site activities on existing vegetation communities within and surrounding the Proposal area. The plan has been developed to fulfil the conditions and commitments prescribed under Ministerial Statement 713 (Appendix 1).

The management objectives for vegetation and flora are:

- to restrict vegetation clearing to a practical minimum

- to prevent unauthorised clearing of native vegetation within the project area
- to ensure vegetation clearing is carried out in an appropriate manner to maximise success of later rehabilitation activities
- to minimise disturbance to remaining vegetation to retain its health and integrity.

3.4 Implementation strategy

3.4.1 Management actions

Day to day responsibility for compliance with this plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. This will mainly involve the supervision of vegetation clearing and surface material removal activities as well as fencing those parts of the conservation zones on the boundary of the premises.

Responsibility for implementing the management actions, monitoring program and otherwise achieving and reporting compliance with the EMP will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

Management actions will be implemented in order to meet the objectives of this Plan (Table 2).

Table 2 Management actions for flora and vegetation

Parameter	No	Action	Timing	Responsibility
Vegetation clearing	FV1	Determine the minimum clearing of vegetation necessary for efficient operations.	Before clearing activities begin	Quarry Manager
	FV2	Conduct flora and fauna surveys of areas (not already surveyed) prior to the commencement of any vegetation clearing	Before clearing activities begin	Quarry Manager AP&D Team
	FV3	Provide coordinates of proposed clearing area to the Planning & Approvals Manager.	Before clearing activities begin	Quarry Manager
	FV4	Check clearing boundary to ensure: <ul style="list-style-type: none"> • all the necessary approvals are in place • clearing will not disturb any known heritage sites or areas of significance. 	Before clearing activities begin	Planning & Approvals Manager
	FV5	Peg areas to be cleared to avoid any unnecessary disturbance to remaining vegetation (Refer to Table 10 for details on pegging).	Before clearing activities begin	Quarry Manager
	FV6	Leave rootstock in-situ where possible (vegetation to be rolled over rather than cleared), and trim tree branches in preference to clearing.	During clearing	Quarry Manager
	FV7	Stockpile cleared native vegetation in a weed-free designated area. Stockpile separately weed-infested cleared vegetation. Retain all brush for rehabilitation purposes	During and after clearing	Quarry Manager
	FV8	Signpost vegetation stockpiles to indicate whether they are from areas with weeds or without weeds.	During and after clearing	Quarry Manager
	FV9	Remove all surface material (A1 horizon or top 100-300mm of soil) immediately following the clearing of vegetation.	After clearing	Quarry Manager
	FV10	Record area cleared and notify Planning & Approvals Manager.	After clearing	Quarry Manager

Parameter	No	Action	Timing	Responsibility
Surface material	FV10	Stockpile separately all surface material in a designated stockpile area for later respreading Store separately surface material from weed-infested areas from weed-free surface material.	After clearing	Quarry Manager
	FV12	Locate designated stockpile areas in the vicinity of the area where the soil originated, but so as not to be disturbed by mining activities and continual movement.	After clearing	Quarry Manager
	FV13	Keep stockpiles as low as possible (2m maximum) with a large surface area for the preservation of seed stock and microbial activity.	After clearing	Quarry Manager
	FV14	Cover and stabilise stockpiles using brush from cleared vegetation, which will be placed over the top and sides of the surface material stockpiles to reduce erosion potential, capture seeds, discourage weeds and maintain moisture and soil microbes.	After clearing	Quarry Manager
	FV15	Include information regarding onsite fire prohibitions and fire response procedures in inductions and training.	Induction and training of personnel and contractors	Quarry Manager
Fire	FV16	Ensure fire-fighting equipment is available at strategic locations around the site	At all times	Quarry Manager
	FV17	Fit selected onsite vehicles with dry chemical extinguishers	At all times	Quarry Manager
	FV18	Maintain appropriate fire and emergency access in all areas	At all times	Quarry Manager
	FV19	Create strategic fire break systems where necessary	As required	Quarry Manager
	FV20	Prohibit all open fires, and burning of vegetation or waste	At all times	Quarry Manager
	FV21	Prohibit smoking onsite	At all times	Quarry Manager
Inductions and Training	FV22	Include flora and vegetation awareness in the site induction and environmental awareness training sessions including information on native vegetation clearing boundaries and access restrictions	As part of induction and environmental training of personnel and contractors	Quarry Manager
Off road driving	FV23	Restrict vehicles to designated access tracks, to prevent vegetation damage and erosion.	At all times	All personnel
Hazardous substances	-	Contain and manage materials that are potentially hazardous to vegetation in accordance with strategies outlined in Sections 11, 12, and 13.	At all times	Quarry Manager
Rehabilitation	-	Progressive rehabilitation measures are detailed in the Preliminary Rehabilitation Management Plan (Section 14).	At all times	Quarry Manager
Weeds and introduced fauna	-	Control and manage weeds and introduced fauna in accordance with the Weed and Introduced Fauna Management Plan (Section 10).	At all times	Quarry Manager
Dust	-	Control dust during construction and operation of the quarry and processing areas to minimise impact to vegetation, in accordance with the Dust Management Plan (Section 9).	At all times	Quarry Manager

3.4.2 Contingency actions

Table 3 Contingency actions for flora and vegetation

Trigger	Action
Breach of clearing boundaries	<ol style="list-style-type: none"> 1. Investigate cause. 2. Re-mark boundaries if due to inadequate boundary marking. 3. Reinforce all personnel of access restrictions beyond clearing boundaries. 4. If disturbance requires mitigation, rehabilitate in accordance with the Preliminary Rehabilitation Management Plan. 5. Complete Environmental Incident Report

Trigger	Action
Decline in vegetation condition along clearing boundary	<ol style="list-style-type: none"> 1. Investigate cause. 2. Undertake remediation of affected vegetation. 3. Modify procedures e.g. dust control, as required.
Population(s) of conservation significant flora species not previously recorded are found within the operational area	<ol style="list-style-type: none"> 1. Stop clearing in the area of the conservation significant flora until investigations have been undertaken and approvals obtained from DEC, if required 2. Investigate opportunities to prevent or minimise the impact to the newly recorded flora. 3. Document results of (2) above, and indicate individual plants to be protected 4. If the flora is classified as DRF, prepare application to take DRF and submit to DEC for approval by the Minister for the Environment in accordance with the Wildlife Conservation Act 1950. Follow all conditions of the permit

3.5 Monitoring and reporting

Monitoring

Table 4 provides monitoring actions to enable an assessment of the effectiveness of the vegetation and flora management actions in place in achieving the objectives and targets. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 4 Monitoring actions for flora and vegetation

Objective	Target	Description of monitoring	Monitoring record	Frequency/ timing
To monitor the integrity of remnant vegetation.	No adverse affects on remnant vegetation from operations.	Visual observations of general condition of remnant vegetation adjacent to the operational footprint.	Monthly inspection checklist	Monthly
To monitor unauthorised clearing/access beyond clearing boundaries.	No unauthorised clearing/access beyond clearing boundaries.	Visual observation of clearing boundaries, lines and markings.	Weekly inspection checklist	Weekly throughout duration of ground-disturbance to undisturbed areas.
Preservation of seed stock and microbial activity	Maximum rehabilitation success.	Visually inspect topsoil stockpiles are as low (2m) as possible with a large surface area and are covered over the topsides with brush from cleared vegetation.	Monthly inspection checklist	Monthly

Reporting

All vegetation clearing undertaken on granted tenements during the construction phase will be described and reported in Annual Environmental Reports submitted to Department of Mines and Petroleum (DMP) on an annual basis. Adherence to this Flora and Vegetation Management Plan and details of vegetation clearing will also be detailed in the Annual Progress and Compliance Report submitted to the DEC.

An internal record of areas disturbed, earth worked or rehabilitated will be maintained and updated following ongoing site surveys. Environmental incidents such as spills, fire, and unauthorised clearing, will be recorded on an Environmental Incident Reporting form.

4. Fauna Management Plan

4.1 Description

The Burrup Peninsula supports a large range of fauna, due to the diversity of habitat types.

The following fauna species protected under the EPBC Act, or suitable habitat for those species, have the potential to occur in the project area (DEWHA 2009):

- Northern quoll *Dasyurus hallucatus* (Endangered)
- Pilbara leaf-nosed bat *Rhinioncteris aurantius (Pilbara form)* (Vulnerable)
- Olive python (Pilbara subspecies) *Liasis olivaceus barroni* (Vulnerable).

The Olive python and Northern quoll utilise rock outcrops as part of their preferred habitat, so may occur in the project area. The Burrup Peninsula is thought to support a healthy population of Pilbara olive pythons, which are particularly vulnerable on roads, where road kill of large individuals of breeding age are fairly common. The Pilbara Leaf-nosed bat prefers caves, so is less likely to occur within the project area.

Migratory terrestrial, wetland and marine bird species protected under the EPBC Act may also utilise or fly over the site, although they do not permanently reside in the area.

4.2 Environmental aspects to be managed

The following environmental aspects of the quarry operation have been identified as requiring management to ensure protection of fauna values:

- vegetation clearing
- vehicle movements
- human activity
- disposal and storage of waste and hazardous material
- noise emissions and vibration
- light spill.

4.3 Environmental performance objectives

This Fauna Management Plan has been prepared to minimise the impact of ongoing site activities on existing fauna and fauna habitat within and surrounding the Proposal area, in accordance with the conditions and commitments prescribed under Statement 713 (Appendix 1).

All native wildlife associated with the project area is protected under the *Wildlife Conservation Act 1950* and specially protected fauna are also protected under the *Wildlife Conservation (Specially Protected Fauna) Notices*.

The management objectives for fauna are:

- To maintain the abundance, diversity and geographic distribution of terrestrial fauna
- To minimise ground disturbing activities to avoid unnecessary disturbance to fauna habitats

- To minimise the risks of outputs such as noise, lighting and wastes impacting fauna.

4.4 Implementation strategy

4.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP and reporting will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 5).

Table 5 Management actions for fauna

Parameter	No	Action	Timing	Responsibility
Fauna protection	Fa1	Include fauna awareness in the site induction and environmental awareness training sessions including information on: <ul style="list-style-type: none"> • importance of protecting native species, particularly those protected under the <i>Environmental Protection and Biodiversity Conservation Act (1999)</i> and <i>Wildlife Conservation Act (1985)</i> (Olive Python and Northern Quoll) • potential for quarry activities to affect fauna and fauna habitat • fauna encounter procedures 	Induction and training of personnel and contractors	Quarry Manager
	Fa2	Prohibit intentional destruction of non-feral fauna. Prohibit capturing or hunting of native fauna	At all times	Quarry Manager
	Fa3	Prohibit employees and contractors from having domestic pets on site	At all times	Quarry Manager
	Fa4	Prohibit firearms on site.	At all times	Quarry Manager
	Fa4	Prohibit unauthorised access into undisturbed or vegetated areas	At all times	Quarry Manager
Fauna encounters	Fa5	Allow native animals encountered onsite to move on if there is no threat to personnel safety in doing so.	At all times	All personnel
	Fa6	Contact DEC for advice if native fauna onsite are likely to be directly affected by construction activities. Relocation of native fauna, if required, must be undertaken by personnel licensed under the <i>Wildlife Conservation Act, 1959</i> .	As required	Quarry Manager
	Fa7	Nominate a carer or call Wildlife Hotline to rescue the animal if sick or injured animals are encountered.	As required	Quarry Manager
	Fa8	Prohibit feeding of native fauna.	At all times	Quarry Manager
Quarry operations	Fa9	Cap, cover, fill or make safe all surface holes for exploration after drilling, to prevent fauna entrapment immediately after drilling. Undertake full rehabilitation with secure plugging to at least 40 cm below ground within 6 months of drilling	At all times	Quarry Manager
	Fa10	Locate a safety bund of overburden and surface material around the perimeter of the quarry pit	At all times	Quarry Manager
Vehicle movements	Fa11	Restrict all vehicles to designated roads and access tracks, except for authorised vehicles in the case of emergency.	At all times	Quarry Manager
	Fa12	Restrict driving on access tracks at dawn, dusk and at night when nocturnal species are active.	Dawn, dusk and night	Quarry Manager
	Fa13	Comply with vehicle speed limits onsite to prevent the likelihood of road kill.	At all times	All personnel
Lighting	Fa14	Assess on-site lighting and implement light spill reduction mechanisms where possible, including installation of shrouding or light shields at sensitive locations, or lowering mounting height of luminaires	As soon as possible	Quarry Manager
	Fa15	Switch off lighting not in use or deemed not essential to personnel safety.	At all times	Quarry Manager

Parameter	No	Action	Timing	Responsibility
Fauna habitat	Fa16	Implement the clearing control in the Flora and Vegetation Management Plan (Section 3).	At all times	Quarry Manager
Fire	-	Implement fire management protocols to reduce the risks to fauna in accordance with management actions FV13 – FV19 in Section 3.	At all times	Quarry Manager
Noise and vibration	-	Implement measures prescribed in the Noise Management Plan (Section 8) to reduce potential noise impacts on fauna	At all times	Quarry Manager
Wastes and hazardous substances	-	Implement waste management actions detailed in Sections 11 and 12, to reduce likelihood of native fauna coming into contact with waste or hazardous substances	At all times	Quarry Manager
Feral animals	-	Implement feral animals management actions to reduce competition and predation on native species as detailed in Section 10.	At all times	Quarry Manager
Rehabilitation	-	Reinstate/ rehabilitate habitat for native fauna as described in Section 14.	At all times	Quarry Manager

4.4.2 Contingency actions

Table 6 Contingency actions for fauna

Trigger	Action
Death or entrapment of native fauna	<ol style="list-style-type: none"> 1. In the event of injury, death or entrapment of Threatened or Priority fauna onsite (Northern Quoll, Pilbara Leaf-nosed Bat, Pilbara Olive python), the DEC Karratha Regional office should be notified as soon as possible 2. Investigate cause 3. If death or entrapment could have been prevented through management modify procedures as required to prevent further occurrences 4. Prepare Environmental Incident Report
Threatened or Priority fauna observed on site	<ol style="list-style-type: none"> 1. Report observation to DEC 2. Seek advice from DEC as to avoidance or relocation measures that may be taken

4.5 Monitoring and reporting

Monitoring

Table 7 provides monitoring actions to enable an assessment of the effectiveness of the fauna management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 7 Monitoring actions for fauna

Objective	Target	Description of monitoring	Monitoring record	Frequency/ timing
To monitor the integrity of remaining fauna habitat	No adverse affects from operations on the integrity of remaining fauna habitat, except for areas authorised to be disturbed	Visual observation of general condition of vegetation adjacent to the operational footprint.	Monthly inspection checklist	Monthly
To monitor for direct fauna impacts	No direct adverse impacts on native fauna	Check quarry site for injured or trapped fauna on roads and tracks or in holes and pits	Weekly inspection checklist	Weekly

Reporting

Records of native fauna deaths within the area of mining operations will be included in the Progress and Compliance Reports to DEC, including the known cause of death and appropriate measures taken to ensure that any unnecessary deaths do not recur. Sightings of threatened and priority fauna will be reported to DEC.

5. Conservation areas Preliminary Management Plan

5.1 Description

The proponent has committed to removing four areas contained in mining leases 255, 306, 309, 331 333 and 353 from future quarrying plans, and managing these areas for natural and cultural heritage conservation. These areas are now part of the Conservation Heritage and Recreation (CHR) zone under the Burrup Peninsula Land Use Plan and Management Strategy (BPLUPMS) (1996). The BPLUPMS defines the management objectives for the CHR zone as:

- to maintain and enhance the conservation and Aboriginal heritage values of the land
- to manage the human interaction with the natural and cultural values of the area in a sustainable manner.

The establishment of the CHR zone in accordance with the objectives of the BPLUPMS, will also achieve the following:

- minimise potential visual impacts from clearing and mining over the area, particularly on elevated portions of Pistol Range visible from publicly accessible areas (the 'Seen Area')
- retain the existing visual 'screen' provided by portions of Pistol Range which limits the visual impacts of existing and future quarry extensions on the publicly accessible areas (the 'Seen Area')
- minimise the extent of disturbance and clearing of vegetation / fauna habitats within the project area
- minimise alterations and permanent impacts to the local landscape
- minimise the potential for impacts on unidentified archaeological and ethnographic sites in the CHR.

The Conservation areas have not been surveyed previously as development and ground disturbing works were never planned for these areas. Holcim now has a responsibility to protect these areas and will conduct flora (including weeds), fauna and Aboriginal Heritage surveys to increase knowledge for the development of better management strategies. In addition, a Blast Impact Assessment has been undertaken (Appendix 8) and a Blast Management Plan (Appendix 9) has been prepared to prevent the potential of fly rock debris entering conservation areas.

Conservation area boundaries within Holcim tenements are shown in Figure 3.

5.2 Environmental aspects to be managed

Environmental aspects that have the potential to impact the conservation areas, and therefore require consideration for management include:

- dust emissions
- weed spread
- human access

- fire
- blasting
- vibration.

5.3 Environmental performance objectives

This Conservation Areas Preliminary Management Plan has been prepared to ensure that ongoing site activities do not affect the areas set aside for conservation. The plan is a temporary measure to provide management while a full plan is under development to fulfil the conditions and commitments prescribed under Ministerial Statement 713 (Appendix 1). The full plan will be finalised when results of surveys of the conservation area become available.

The management objectives for the conservation areas are:

- to prevent introduction of new weed species and control the spread of existing weed populations into the lease conservation sites
- to protect Aboriginal heritage sites within the conservation areas
- to manage impacts of construction activities including dust, fly rock, and vibration, to ensure that these do not lead to clearing of native vegetation or impacts on significant flora or fauna
- to protect the integrity of vegetation in conservation areas from the projects activities, including flora species of conservation significance.

5.4 Implementation strategy

5.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. This will mainly involve clearly defining the boundaries of the conservation zones immediately adjacent to the premises. The following management actions will be implemented in order to meet the objectives of this Plan.

Table 8 Management actions for conservation areas

Parameter	No	Action	Timing	Responsibility
Information and education	CA1	Include in induction and training sessions reference to restrictions over access and preventing disturbance to the conservation area.	Induction and training of personnel and contractors	Quarry Manager
	CA2	Conduct flora, fauna and Aboriginal heritage surveys of the conservation area within the lease boundary.	Within 12 months of approval of this plan	Quarry Manager
All below	CA3	Review management action following the receipt of results of surveys.	Within 1.5 years of the approval of this plan	Quarry Manager
Access	CA4	Define conservation zone boundaries with painted and flagged star pickets: <ul style="list-style-type: none"> • green tipped/flagged star picket for conservation area • yellow tipped/flagged star picket for the 20 m buffer around Aboriginal Heritage sites • red tipped/flagged star picket for tenement boundaries Star picket locations are to be confirmed by Global Positioning System (GPS) at the time of installation and recorded in the Pegging Register along with date and reason for installation.	At all times	Quarry Manager

Parameter	No	Action	Timing	Responsibility
	CA5	Check boundaries to ensure: <ul style="list-style-type: none"> spacing between markers does not exceed 100 m all adjacent posts are visible on either side from each post all corners are marked. 	Prior to any ground disturbance	Quarry Manager
	CA6	Prohibit access into conservation areas unless permission is received from the Quarry Manager.	At all times	Quarry Manager
Dust Management	-	Implement management actions in accordance with the Dust Management Plan (Section 9).	At all times	Quarry Manager
Fire Management	-	Implement fire risk reduction and control management actions that apply to the conservation area described in FV13 – FV19 in Section 3.	At all times	Quarry Manager
Weeds	-	Implement weed management actions as detailed in Section 10.	At all times	Quarry Manager
Blasting & Vibration		Implement management actions in accordance with the Blast Management Plan (Appendix 9)	At all times during blasting activities	Drill & Blast Consultant

5.4.2 Contingency actions

Table 9 Contingency actions for conservation areas

Trigger	Action
Boundary identification damaged or removed	<ol style="list-style-type: none"> Determine cause if possible Take appropriate measures to reduce the chance of recurrence Repair/replace star pickets and signs if necessary Complete Environmental Incident Report
Disturbance or tracks at edges of conservation area	<ol style="list-style-type: none"> Determine cause if possible Take appropriate measures to reduce the chance of recurrence Complete Environmental Incident Report
Increase in weed coverage or new weed species observed	<ol style="list-style-type: none"> Report to DEC as soon as possible after the event. Develop and implement control measures in consultation with DEC.
Unauthorised clearing	<ol style="list-style-type: none"> Stop all clearing activities Fence off area. Report to DEC as soon as possible after the event. Develop and implement rehabilitation and monitoring actions in consultation with DEC. Determine cause Take appropriate measures to reduce the chance of recurrence Complete Environmental Incident Report
Evidence of fly rock in conservation areas	<ol style="list-style-type: none"> Stop all blasting activities. Review compliance to blast management plans and procedures with the contractor. Determine root cause Take appropriate measures to prevent recurrence. Report to the DEC as soon as possible after the event. (note: if the incident is considered to be "significant" the DEC should be notified immediately i.e. within 24hours) Complete Environmental Incident Report
Fire in conservation areas	<ol style="list-style-type: none"> Report to DEC, as soon as possible after the event. Determine appropriate fire control measures and subsequent management of burnt area in consultation with DEC Complete Environmental Incident Report

5.5 Monitoring and reporting

Monitoring

Table 10 provides monitoring actions to enable an assessment of the effectiveness of the conservation area actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 10 Monitoring actions for conservation areas

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
Monitor boundary delineation to reduce chances of unauthorised access to conservation areas	No damage to, movement of or removal of boundary identification (star pickets and signage)	Inspections of star pickets and signage at the boundary of mining areas and conservation areas. Check locations of star pickets with GPS to ensure that movement has not occurred.	Monthly inspection checklist	Monthly
Monitor blasting to assess potential impacts to conservation areas	No fly rock entering conservation areas	Visual observation, including observation during blasting activities to see whether fly rock enters conservation areas, and checking conservation areas for evidence of fly rock.	Monthly inspection checklist	Monthly
To monitor the effect of vibration on loose rock piles	No impact from blasting on significant sites within conservations zones	Photographic monitoring of significant sites within the conservation zone. Baseline photos to record the state of the site, followed by photos taken at six monthly intervals, or after significant weather events, when blasting is further than 100m away	Six monthly inspection	Six monthly
To monitor the spread of dust	To ensure dust from quarry operations does not enter conservation areas	Visual observation of the boundary of mining areas and conservation areas to determine whether dust crosses the boundary into conservation areas. Inspections are to be correlated and augmented with information from the dust deposition gauges, as outlined in Section 9.	Monthly inspection checklist	Monthly and opportunistically
To monitor weeds within the conservation area	No declared weeds within conservation areas. No increase in weed coverage within conservation areas	Observation of weed species and estimation of weed coverage in conservation areas	Quarterly inspection checklist	Quarterly (for weed coverage compare with same time previous year)

Reporting

Internal reporting of any breaches of conservation area boundaries, and environmental incidents affecting the conservation areas, such as fire, shall be reported.

Reporting requirements to DEC will be detailed in the final Conservation Area Management Plan (in preparation) after the completion of surveys and review of management actions based on survey results.

6. Visual Impact Management Plan

6.1 Description

The quarry is not visible from any major towns or population centres. Pistol Range provides a natural barrier preventing views of the quarry from locations north of the range. The conservation areas also provide a visual buffer to the quarry. The quarry is visible from parts of the Pistol range, above the quarry, and sections of the upper quarry faces are also visible from the coastal plain to the south.

6.2 Environmental aspects to be managed

The following aspects of the quarry operation have been identified as requiring management to ensure protection of visual amenity values:

- location and characteristics of bunds, stockpiles, roads and infrastructure
- vegetation clearing
- rehabilitation (e.g. rock colour, slope of final landform, revegetation).

6.3 Environmental performance objectives

This Visual Impact Management Plan has been prepared to minimise the impact of ongoing site activities on the visual amenity of the quarry, especially the view from sensitive areas and publicly accessible locations outside of the quarry area. The plan has been developed to fulfil the conditions and commitments prescribed under Ministerial Statement 713 (Appendix 1).

The management objectives for visual amenity are:

- To improve the visual amenity of the quarry from the coastal plain to the south
- To prevent further visual amenity impacts of the quarry when viewed from the Pistol Range.

6.4 Implementation strategy

6.4.1 Management actions

The following management actions will be implemented in order to reduce visual impact of the quarry and meet the objectives of this Plan (Table 11).

Table 11 Management actions for visual impact

Parameter	No	Action	Timing	Responsibility
Bunds	VA1	Construct the southern part of the quarry safety bund to heights of up to 2.5 m to reduce the extent of the quarry faces visible from the plain	During operation	Quarry Manager
	VA2	Construct the visible part of the quarry safety bund with reddish brown coloured rocks and surface material to blend in with existing landscape	During operation	Quarry Manager

Parameter	No	Action	Timing	Responsibility
Rehabilitation	VA3	Rehabilitate the upper bench of the south-facing quarry slopes in the western quarry extension which are visible from the plain by: <ol style="list-style-type: none"> 1. Reducing the finished visible faces to a maximum 1:1 slope 2. Covering the reduced slopes with reddish brown coloured rocks and surface material 3. Encouraging establishment of vegetation (mainly <i>Triodia</i> (Spinifex) species) 4. Seeding areas with local seed if recolonisation is not progressing adequately within 18 months 5. Meeting with DEC and DMP annually for five years to discuss rehabilitation progress and options 	During operation	Quarry Manager
	VA4	Implement progressive rehabilitation as disturbed areas become available to reduce visual impact, including rehabilitation of mined pit faces, pit floors and other areas as required	At all times	Quarry Manager
Stockpiles	VA5	Assess the feasibility of relocating existing plant and stockpiles to within the quarry pit to reduce visual impact of quarry	Annually	Quarry Manager
	VA6	Stockpile armour rock within the Western Extension pit avoiding the need for additional stockpiles typically used for current quarrying operations.	Following extraction of the western extension	Quarry Manager
	VA7	Ensure stockpiles are less than 12 m in height	At all times	Quarry Manager
Dust	-	Implement dust management actions – see Dust Management Plan (Section 9)	At all times	Quarry Manager

6.4.2 Contingency actions

Table 12 Contingency actions for visual impact

Trigger	Action
Public complaint	Investigate nature of complaint and determine whether response actions are required
Stockpiles or bunds exceed agreed heights	Reduce to agreed heights

6.5 Monitoring and reporting

6.5.1 Monitoring

Table 13 provides monitoring actions to enable an assessment of the effectiveness of the visual amenity management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 13 Monitoring actions for visual impact

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
Monitor to ensure operations are in compliance with visual impact management plan	Ensure all visual amenity objectives are being met	Visual inspection of quarry areas - pits, bunds, stockpiles, infrastructure and cleared areas and rehabilitation areas	Quarterly inspection report	Quarterly
To monitor height of stockpiles and bunds	Stockpiles to be no greater than 12 m in height Bunds to be no greater than 2.5 m in height	Measure height of stockpiles and southern safety bunds	Quarterly inspection report	Quarterly

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
Monitor visual amenity to identify areas that require attention that may not be obvious from inside site boundaries	Ensure all visual amenity objectives are being met	View of quarry from strategic vantage points outside site - Dampier Road, Pistol Range, Coastal Plain – visual inspection	Quarterly inspection report	Quarterly

6.5.2 Reporting

Records of visual amenity management actions and status will be included in the Progress and Compliance Reports to DEC.

7. Aboriginal Heritage Management Plan

This Management Plan shall be implemented in conjunction with the Nickol Bay Quarry Cultural Heritage Management Plan (Appendix 6).

7.1 Description

The Nickol Bay Quarry is located adjacent to a number of areas of cultural significance, being with the area of the Burrup Peninsula and Dampier Archipelago. Areas of the Dampier Archipelago were added in 2007 to the National Heritage by the Federal Minister for the Department of Environment and Water. Several Aboriginal heritage sites are present within Nickol Bay Quarry tenements. Options for heritage sites which are situated in the proposed quarry footprint (extension areas) are currently being investigated. One or more of the following actions may be implemented in regard to these sites:

- relocate site material to land outside of the quarry extension area, or protected through other means, in consultation with local Aboriginal representatives
- modify the proposed quarry extensions to avoid Aboriginal sites and provide an adequate buffer zone around the Aboriginal sites
- apply for approval to disturb sites under section 18 of the *Aboriginal Heritage Act 1972* (WA).

All actions regarding Aboriginal heritage sites are undertaken in consultation with local Aboriginal representatives and the Department of Indigenous Affairs (DIA), in accordance with the *Aboriginal Heritage Act 1972*.

7.2 Environmental aspects to be managed

The following aspects of the quarry operation have been identified as requiring management to ensure protection of Aboriginal heritage values:

- clearing
- human access
- blasting
- vibration
- dust emissions.

7.3 Environmental performance objectives

This plan details management procedures to protect Aboriginal Heritage sites on granted tenements during operation of the Nickol Bay Quarry, both within and in proximity to active project areas. The performance standard in relation to Aboriginal sites for the project is to protect all Aboriginal sites in accordance with the provisions of the *Aboriginal Heritage Act 1972*.

The management objective for Aboriginal heritage is:

- to avoid disturbance to Aboriginal heritage sites.

7.4 Implementation strategy

7.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP and reporting requirements will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 14).

Table 14 Management actions for Aboriginal heritage

Parameter	No	Action	Timing	Responsibility
Information	AH1	Include in induction program for all quarry personnel (including contractors) information on: <ul style="list-style-type: none"> • significance of Aboriginal heritage and the potential impacts of the project • procedures to report potential new sites • obligations under the <i>Aboriginal Heritage Act 1972 (WA)</i> • requirements for the protection of known Aboriginal sites. • procedures in the event of disturbance of a known heritage site and/or the discovery of a suspected heritage site 	Induction and training of staff and contractors	Quarry Manager
	AH2	Establish and maintain a register of sites of Aboriginal significance within the site, including GIS records of site locations, and site descriptions. Make this register available to contractors and relevant employees, except in the case that Aboriginal people or DIA wish for site locations to remain undisclosed (see AH3).	Within 6 months of implementation of this EMP	Quarry Manager
	AH3	Keep confidential the precise location of sites recorded in heritage surveys undertaken on behalf of Holcim if requested by Aboriginal representatives or the DIA. No public release of any such site specific information will be undertaken without express permission of the DIA.	At all times	Quarry Manager
Site protection	AH4	Flag and/or fence the boundaries of Aboriginal sites in the vicinity of construction or operation areas to ensure activities do not intrude into areas where Aboriginal sites are present.	During operations	Quarry Manager
	AH5	Implement contingency actions in Table 15 in the event of disturbance to a known heritage site	At all times	Quarry Manager
	AH6	Implement contingency actions in Table 15 in the event of discovery of a suspected heritage site	At all times	Quarry Manager
	AH7	Dismiss personnel who are not authorised to deliberately disturb identified Aboriginal sites Advise relevant authorities of the disturbance.	At all times	Quarry Manager
Communi- cation	AH8	Conduct all dealings with Aboriginal Groups with reference to the Holcim Guidelines for Community Awareness (SHE 4.6). and in accordance with heritage agreements between Holcim and the Traditional Owners	At all times	Quarry Manager
	AH9	Notify the DIA of the outcome of on-site meeting(s) held between Holcim, Aboriginal consultants and relevant Aboriginal Groups regarding the management of identified significant sites.	After meetings	Quarry Manager
	AH10	Maintain regular ongoing communication with representatives of local Aboriginal groups, and ensure consultation and involvement of the local Aboriginal people occurs in matters of heritage management	At all times	Indigenous Relations Officer

7.4.2 Contingency actions

Table 15 Contingency actions for Aboriginal heritage

Trigger	Action
Site disturbance of known heritage site	<ol style="list-style-type: none"> 1. Stop work immediately 2. The person responsible for, or first on the scene of, the incident will notify the Quarry Manager 3. Investigate the cause of the incident, the level of severity, and all other relevant information noted 4. Record the incident in an Environmental Incident Report form 5. Report the incident to regulatory authorities including DIA and DEWHA and relevant Aboriginal stakeholders 6. Implement corrective actions to mitigate harm in consultation with the DIA and Aboriginal stakeholders 7. Review and revise heritage management measures as appropriate to prevent recurrence.
Detection of suspected Aboriginal heritage site (previously unrecorded)	<ol style="list-style-type: none"> 1. Immediately cease all works in the area and inform the Quarry Manager. 2. Erect fence/flagging /barrier around the potential heritage site including a 10 m buffer with 'Keep Out' signage until further advice is received. 3. Determine the authenticity of the site or material using appropriate methods, in consultation with relevant stakeholders. A qualified archaeological consultant, who has been issued with a Section 16 under the Aboriginal Heritage Act will assess the significance of the site and determine the next course of action, in accordance with the wishes of the Aboriginal Community. 4. Notify the DIA in accordance with section 15 of the Aboriginal Heritage Act, 1972 through completion of an Aboriginal Site Recording Form (available from the DIA website). The DIA must be notified of the site within a timely manner, preferably within seven days of discovery of potential site. Notify police if skeletal remains are involved. 5. Record details of the site discovery for internal management records, including: <ol style="list-style-type: none"> a. date and time of the discovery b. method by which the site was uncovered, and the project activities occurring at the time c. site description / nature of the site d. nature of investigations taken in relation to the potential site e. action taken in relation to the site (including supplementary monitoring and corrective actions) f. reasons for taking no action in relation to the site (if such a decision was made) g. outcomes of the process. 6. Update induction material for quarry personnel as required. 7. Implement suitable mitigation/management measures as soon as practicable once agreed upon by stakeholders. 8. Investigate potential for site avoidance. Where disturbance to the site can be avoided (e.g. via reconfiguration of the development), actions may include compiling a detailed site record, collection of the cultural material or protection of the site (e.g. fencing). 9. Where avoidance is not practicable, seek consent to disturb the site from the Minister for Indigenous Affairs through a Section 18 application under the Aboriginal Heritage Act 1972 (WA), in consultation with the Native Title holders. Prior to making an application under the Aboriginal Heritage Act 1972 (WA), ensure that detailed archaeological recording of the relevant site is conducted by a qualified archaeologist, and consult in good faith with to determine acceptable methods by which site may be disturbed. If required, the necessary clearances to disturb the site will be obtained under Section 18 of the Aboriginal Heritage Act.

7.5 Monitoring and reporting

Monitoring

Table 16 provides monitoring actions to enable an assessment of the effectiveness of the Aboriginal heritage management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 16 Monitoring actions for Aboriginal heritage

Objective	Target	Description of monitoring	Monitoring record	Frequency/ timing
To monitor the condition of known heritage sites	No unauthorised site disturbance	Visual inspections of known heritage sites from the boundary of heritage site, in accordance with site-specific requirements as indicated by Aboriginal representatives or the DIA	Quarterly inspection report	To be determined in consultation with local indigenous groups
To monitor ground-disturbance in collaboration with local indigenous representatives	No unauthorised site disturbance	Monitoring ground clearing and initial excavation works within project area in collaboration with local indigenous representatives Monitor relocation of any aboriginal sites (as approved under a Section 18 notice of the AHA) in collaboration with local indigenous representatives	Quarterly inspection report	To be determined in consultation with local indigenous groups
To monitor drilling and blasting operations in collaboration with local indigenous representatives	No unauthorised site disturbance	Provide opportunity for local indigenous groups to monitor drilling and blasting operations (within occupational health and safety constraints) when blasting is within 21 metres of a known cultural heritage site.	Quarterly inspection report	To be determined in consultation with local indigenous groups
To monitor the effect of vibration on loose rock piles	No impact from blasting on Aboriginal heritage sites	Photographic monitoring heritage sites. Baseline photos to record the state of the site, followed by photo's taken at six monthly intervals, or after significant weather events, when blasting is further than 100m away	Six monthly inspection	Six monthly
To monitor actual disturbance against approved disturbance footprint	No unauthorised site disturbance	Reconciliation of approved clearing with actual clearing	Quarterly inspection report	Quarterly

Reporting

Prior to ground disturbance monitoring with local indigenous representatives will occur. Upon completion of any ground disturbance a record of the inspection by the local indigenous representatives shall be made.

The location of recorded heritage sites shall be entered into the Nickol Bay Quarry Cultural Heritage Sites Register to ensure marked heritage sites are correctly documented.

Internal records shall be kept regarding formal and informal communication with Aboriginal representatives. The DIA will be notified of the outcome of all meeting(s) held between Holcim and Aboriginal consultants or relevant Aboriginal Groups regarding the management of heritage sites.

Results of periodic inspections and records of environmental incidents will be included in the Progress and Compliance Reports to DEC. Significant incidents will be reported immediately to the Karratha Regional Office of the DEC, as well as to the DIA and to Aboriginal representatives.

8. Noise management plan

8.1 Description

Noise and vibration associated with quarrying activities include drilling and blasting, crushing and screening, and loading and transport of product. Blasting may produce the loudest noise of quarrying operations, and currently occurs approximately twice a week. Holcim monitors noise levels for all blasts.

Noise from quarrying activities at sensitive receptors can be further amplified by meteorological conditions, such as atmospheric temperature inversions and certain wind speeds and directions. The level of noise and ground vibration associated with blasting is also affected by the local geology. The existing landforms of the Pistol Range and the designated conservation areas around the quarry assist in the screening of noise associated with daily operations. Barriers such as bund walls also aid in reducing noise transmission.

Noise and vibration can be a potential nuisance to users of nearby areas. The closest organisations to the existing operation are the pistol club, approx 300 m away from the quarry pit, and the racetrack, approximately 800 m away from the quarry pit. Neither of these premises are classified as noise-sensitive, and generate substantial noise through their own activities. There are no residences close enough to the quarry to be affected by noise from the quarry.

Fauna can be sensitive to noise. Loud noise and vibrations can change the behaviour of native fauna, and result in avoidance of areas, effectively reducing the suitable habitat for these fauna species.

8.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management to ensure noise and vibration emissions from the quarry do not affect the amenity of nearby noise-sensitive premises:

- drilling and blasting
- crushing and screening
- loading and transport.

8.3 Environmental performance objectives

Noise emissions from day to day operations at the Nickol Bay Quarry are to meet the criteria in the *Environmental Protection (Noise) Regulations 1997*. There are special regulations which allow for reasonable amounts of economic, cultural and social activity which may exceed the assigned levels, but are within normal community expectations. In addition, there are prescribed noise limits for blasting activities ('airblast level'), under Regulation 11.

For daytime blasting (between 7am and 6pm on any day except Sunday or public holiday), the airblast level must not exceed 125 dB $L_{Linear\ peak}$ for any blast; and 120 dB $L_{Linear\ peak}$ for nine in any 10 consecutive blasts, regardless of the interval between blasts. For blasting carried out between 7am and 6pm on a Sunday or public holiday, the airblast level must not exceed 120 dB $L_{Linear\ peak}$ for any blast; and 115 dB $L_{Linear\ peak}$ for nine in any 10 consecutive blasts, regardless of the interval between blasts. At other times (outside the period between 7 am and 6 pm on any day) airblast levels must not exceed 90 dB $L_{Linear\ peak}$.

Airblast levels are measured at the receiving premises, not within the area of noise generation. As there are no sensitive neighbours to Nickol Bay Quarry, and the nearest residential area, Dampier, is several kilometres away, compliance with noise regulations is unlikely to be problematic.

The management objectives for noise are:

- to ensure noise and vibration levels associated with quarrying operations comply with the Noise Regulations
- to protect the amenity of premises in proximity to the Nickol Bay Quarry from quarry noise
- to keep relevant stakeholders informed of blasting activities
- to minimise noise impacts on native fauna, both on and offsite.

8.4 Implementation strategy

8.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisors). Responsibility for achieving compliance with the EMP and reporting requirements will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 17).

Table 17 Management actions for noise

Parameter	No	Action	Timing	Responsibility
Personnel	N1	Include in the induction information on the potential nuisance to neighbours of noise and vibration, and management measures to reduce the impact.	Induction	Quarry Manager
	N2	Provide personnel access to operational manuals for equipment at all times, to ensure all personnel are familiar with the procedures detailed in the operations manual.	At all times	Quarry Manager
	N3	Train personnel in the operation of equipment that has the potential to generate noise emissions.	Training	Quarry Manager
Blasting	N4	Design blasts to reduce noise and vibration emissions. Investigate opportunities to improve blast design and reduce the number of blasts on an ongoing basis.	Ongoing	Blasting contractor
	N5	Ensure blasting is conducted by a licensed contractor in accordance with DMP requirements	At all times	Quarry Manager
Equipment	N6	Use mobile and fixed equipment in the mining and processing of materials that is the quietest reasonably available.	At all times	Quarry Manager
	N7	Implement noise control measures for vehicles and other equipment, including use of silencers and noise attenuation on construction equipment, and fitting mobile and stationary equipment with effective exhaust mufflers.	As required	Quarry Manager
	N8	Inspect and maintain all noise control equipment regularly to ensure good working order and all noise control equipment is correctly fitted and operating at design performance.	Monthly	Quarry Manager
	N9	Fit new crushing and screening infrastructure with best practice noise suppression features.	As required	Quarry Manager
Vehicle movements	N10	Ensure compliance with onsite speed limits at all times, including on haul roads, access tracks and in the stockpile and processing area.	Ongoing	All personnel

Parameter	No	Action	Timing	Responsibility
	N11	Maintain access tracks and haul roads in good condition to prevent corrugation that contributes to truck noise.	At all times	Quarry Manager
	N12	Restrict vehicle movements at night to avoid noise sensitive periods	At night	Quarry Manager
Surrounding infrastructure	N13	Manage blasting within 100 m of the Epic Energy gas pipeline (Western Extension) to meet the requirements of Epic Energy and DMP, and in accordance with safety conditions prescribed under the Standards Association of Australia Gas Pipeline Code 1697-1981 and AS2885-1997) to ensure that there is no damage to the pipeline from blasting vibrations.	During development and quarrying of eastern extension	Quarry Manager
Hours of operation	N14	Limit operation of high noise activities to reduce potential impact on neighbours.	At all times	Quarry Manager
	N15	Restrict blasting to between the hours of 0900 and 1800 hours (unless otherwise approved) to reduce noise impacts at sensitive receptors.	At all times	Quarry Manager
Informing stakeholders	N16	Advise appropriate stakeholders of blasting times and working schedules. Notify the Karratha Airport of all blasts during work hours not less than 24 hours prior to the blast, in order for a Notice to Airmen (NOTAM) concerning the blast to be issued by the Civil Aviation Safety Authority.	Not less than 24 hours prior to blasting	Quarry Manager

8.4.2 Contingency actions

Table 18 Contingency actions for noise

Trigger	Action
Monitoring results indicate noise and/or vibration levels exceed levels prescribed in the Noise Regulations.	<ol style="list-style-type: none"> Investigate to determine the cause of non-compliance. Take preventative actions to prevent further non-compliance, including as appropriate: not operating some of the equipment and machinery, or using machinery with lower noise emissions <ul style="list-style-type: none"> establishing sound barriers changing the timing of offending activities. Initiate a feedback loop to review management measures and/or further educate staff/contractors to ensure that all possible steps are taken to prevent any reoccurrence. Complete an Environmental Incident Report
Noise complaint received	<p>Noise complaints received will be managed in accordance with the Public Complaint Resolution procedures. The Quarry Manager will contact any complainants that have concerns related to noise levels and maintain contact until such time as the source of the incident is verified and resolved as far as practicable.</p> <p>If the nuisance is of an ongoing nature, the Quarry Manager, will take steps to determine the nature of the noise nuisance ensure that the noise source is addressed within 48 hours. If the source is not clear, the Quarry Manager may initiate additional monitoring or other site evaluation, which may include a specific noise survey conducted in accordance with the Holcim standard noise survey protocols (SHE 4.2.5A)</p> <p>Corrective action will be implemented to address the nuisance if it is caused by site activities that may be prevented.</p> <p>The complaint shall be recorded in the Holcim Environment Complaints Register (SHE 4.6A) detailing date, nature, and resolution action undertaken</p>

8.5 Monitoring and reporting

Monitoring

Table 19 provides monitoring actions to enable an assessment of the effectiveness of the noise management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager. The Holcim guideline for assessment of Noise impacts and mitigation

measures (SHE 3.17) provides additional guidance for monitoring. Monitoring data is available to confirm compliance with noise requirements of licence and approval conditions.

Table 19 Monitoring actions for noise

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
To monitor noise levels	Noise generated by blasting activities complies with the Noise Regulations 1997	Measurement of blast noise levels at relevant receptor sites	Quarterly inspection report	Quarterly
To monitor equipment	All vehicles and machinery in good working order, including any noise control equipment fitted to machinery	On-site inspections of vehicles and machinery, including the integrity of noise control equipment	Monthly inspection report	Monthly

Reporting

Records of any incident that results in unacceptable noise generation shall be reported under the Holcim Environment Incident and Non Conformance Report Form (SHE 5.1). Where applicable, the Holcim Environmental Hazard Register and Action Plan (SHE 4.2.1A) shall be completed as part of internal reporting requirements.

Records of environmental incidents will be included in the Progress and Compliance Reports to DEC. Significant incidents will be reported to the Karratha Regional Office of the DEC in accordance with Condition G1 (a) and (b) of Environmental Protection Licence 4741.

A Complaints Register will be established to record any complaints received, date, nature, and resolution action undertaken (SHE 4.6A). Records of complaints will be forwarded to the Karratha Regional Office of the DEC within 24 hours of receiving the noise complaint.

9. Dust management plan

9.1 Description

Wind-blown dust naturally occurs throughout the Pilbara region but additional dust may be generated by quarrying activities such as drilling and blasting, crushing and screening, vehicle movements on unsealed dry surfaces, and also by strong winds over unsealed dry surfaces/stockpiles. The potential for dust generation increases in the drier winter months as dry soil is less cohesive.

Dust has the potential to create nuisance for users of nearby areas, to smother vegetation close to the dust source (e.g. vegetation adjacent to haul roads), and to affect Aboriginal heritage sites. Land uses surrounding the project area, in particular the race track, also have the potential to generate dust, which may lead to cumulative impacts.

Holcim implements a number of dust suppression controls, such as application of water to dust prone surfaces and the use of baghouses and water sprays on the processing plant. Dust is not normally visible beyond the boundary of the quarry during quarry operation.

9.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management for dust emissions:

- physical disturbance of the land surface (during clearing, and surface material removal)
- drilling and blasting
- vehicle movement (on unsealed roads and movement of heavy vehicles with uncovered loads)
- crushing and screening
- wind erosion (of dry exposed surfaces such as open pit areas, stockpiles and unsealed roads).

9.3 Environmental performance objectives

The plan has been developed to meet all statutory requirements and to fulfil the objectives, conditions and commitments prescribed under:

- Statement 713 (Appendix 1)
- Environmental Protection Licence No 4741/9 (currently being amended to a premises licence).

This Dust Management Plan has been prepared to ensure that ongoing site activities are conducted in manner that minimises the potential for onsite and offsite dust impacts as far as practicable.

Management objectives for dust are:

- to prevent visible dust crossing the premises boundary.
- to receive no justified public complaints relating to dust generated from quarrying operations

- to prevent dust-related impacts to vegetation that has not been approved to be disturbed throughout the duration of the proposal, both within and outside of site boundaries
- to minimise dust entering the conservation zone, in order to reduce the likelihood of impacts to flora, fauna, Aboriginal heritage, and surface water and to maintain the environmental values of this area.

9.4 Implementation strategy

9.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP and reporting requirements will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 20).

Table 20 Management actions for dust

Parameter	No	Action	Timing	Responsibility
Induction	D1	Include in the induction information on: <ul style="list-style-type: none"> • dust management measures implemented onsite • vehicle speed limits enforced onsite • potential for dust to affect vegetation and be nuisance to people in the vicinity. 	Induction and training of personnel and contractors	Quarry Manager
Dust suppression through water application	D2	Use a water cart /truck to regularly wet down dust-prone unsealed surfaces such as haul and access roads, and the quarry face during earthworks and operations. Increase watering frequency on dry windy days to prevent dust liftoff	As required	Quarry Manager
	D3	Operate a network of manual water sprays at the crusher feed, conveyor transfer points and stacker tips. Operate regularly water spray systems in the stockpile area to form a crust.	At all times	Quarry Manager
	D4	Wet all product material loaded onto trucks for export over public roads using a spray bar facility at the washdown bay	At all times	Quarry Manager
Equipment	D5	Enclose conveyors, screening and crushing plants where practicable	At all times	Quarry Manager
	D6	Fit dust extraction system and bag-houses to the Plant where practicable	At all times	Quarry Manager
	D7	Maintain dust suppressors on the crushing plant and on quarry drills	At all times	Quarry Manager
Drilling and blasting	D8	Schedule drilling and blasting to avoid meteorological conditions that may spread dust emissions into nearby conservation areas.	Prior to blasting	Blasting contractor
Vehicle movement	D10	Observe onsite vehicle speed limits to reduce wheel-generated dust lift-off	At all times	All personnel and contractors
Minimise soil exposure and ground disturbance	D11	Retain vegetated areas until required ahead of quarry development in order to reduce the area of soil exposed at any one time.	Prior to quarrying	Quarry Manager
	D12	Undertake progressive rehabilitation in accordance with the Progressive Rehabilitation Plan to reduce the period of time that exposed areas are dust prone	After operations complete	Quarry Manager
Public complaints	D13	Record public complaints in the Public Complaints Register.	When complaint is received	Person taking complaint

9.4.2 Contingency actions

Corrective action will be implemented as necessary with reference to the Holcim Dust Control Hierarchy (SHE 3.22B) and the Holcim Incident Reporting and Investigation Guidelines (SHE 5.1).

Table 21 Contingency actions for dust

Trigger	Action
Dust visible in conservation areas	<ol style="list-style-type: none"> 1. Investigate cause/source of dust 2. Implement additional dust control measures including, as appropriate: <ul style="list-style-type: none"> • increased application of water • application of dust suppressants to vehicle loads and stockpiles. 3. Moderate activities generating dust if actions listed under (2) above are inadequate to reduce dust emissions to acceptable levels. 4. Complete an Environmental Incident Report
Excessive dust accumulated on vegetation.	<ol style="list-style-type: none"> 1. Investigate cause/source of dust 2. Implement additional dust control measures. 3. Complete an Environmental Incident Report 4. Independent review of the condition of native vegetation adjacent to the quarry
Public complaint regarding dust received	<p>The Quarry Manager will contact any complainants that have concerns related to dust and maintain contact until such time as the source of the incident is verified and resolved as far as practicable.</p> <p>The completed Holcim Environment Complaints Register (SHE 4.6A) which establishes the date, nature, and resolution action undertaken will be provided to the complainant upon resolution of the complaint.</p>
Dry windy conditions	Increase dust suppression through increased application of water and evaluate the need to delay blasting activities until more favourable conditions return.
Significant contribution to dust deposition as measured by dust deposition gauges	<ol style="list-style-type: none"> 1. Review and improve dust control measures 2. Increase monitoring frequency to monthly 3. Assess effectiveness of improved dust control measures 4. Repeat 1 – 3 as necessary to achieve acceptable outcome.

9.5 Monitoring and reporting

9.5.1 Monitoring

Table 22 provides monitoring actions to enable an assessment of the effectiveness of the dust management actions in place. Monitoring is, for the most part, the responsibility of the site Quarry Manager. Objective dust assessment will be provided by dust deposition gauges placed at four locations adjacent to the quarry (approximately north, south, east and west of the quarry). The prevailing annual wind direction is from an easterly direction (BoM 2010). As the monitoring locations will be on four sides of the quarry; at any one time the deposition monitors will be picking up the potential dust impacts (downwind) and providing a control measurement (upwind) during the monthly sampling period. When the dust deposition readings are taken, the average wind direction and speed for that month will also be recorded from the local weather station data. This will allow an interpretation to be made as to whether the quarry is having a significant impact on dust.

Holcim SHE Guideline 3.22 provides further guidance for assessing non-silica dust impacts and mitigation measures.

Table 22 Monitoring actions for dust

Objective	Target	Description of monitoring	Monitoring record	Frequency/ timing
To identify cases when dust suppression measures are required	No greater than 20% opacity of visual dust emissions (opacity: a visual evaluation of the amount of one's view that is obscured by a dust plume)	Observation of visible dust emissions from unsealed surfaces prone to dust generation (e.g. haul roads, stockpiles, quarry face).	Weekly inspection checklist	Weekly and opportunistically, especially when undertaking dust generating activities.
To prevent the impact of dust emissions on conservation areas	No dust emissions leaving the site boundary or entering the conservation zones (except where dust is the result of blasting)	Observation of gas, fume or dust from plant or equipment going offsite or into conservation zones	Weekly inspection checklist	Weekly and opportunistically, especially when undertaking dust generating activities.
To monitor the condition of dust suppression equipment	Correct functioning of dust suppression equipment (e.g. automatic water sprayers, bag-houses) at all times	Inspection of dust suppression equipment within the processing plant and stockpile area.	Monthly inspection report	Monthly
To monitor the effectiveness of dust suppression equipment	Dust suppression equipment maintains dust emission to within 20% opacity	Observation of dust emissions during operation of dust suppression equipment	Monthly inspection report	Monthly
	No statistically significant increase in measured dust levels attributable to quarry operations	Dust deposition gauges at four locations adjacent to the quarry. Dust deposition results will be interpreted using local wind data from Karratha Airport.	3-monthly data collection	3-monthly
	No significant increase in accumulation of dust on native vegetation	Observation of dust accumulation on native vegetation at four photo-points located adjacent to the dust gauges	Annually	Annually

9.5.2 Reporting

Dust incidents will be reported under the Holcim Environment Incident Non Conformance Report Forms (SHE 5.1) and the Holcim Environment Complaints Register (SHE 4.6A). Where applicable, the Holcim Environmental Hazard Register and Action Plan (SHE 4.2.1A) shall be completed as part of internal reporting requirements.

Records of environmental incidents and data from 3-monthly collection of dust samples will be included in the Progress and Compliance Reports to DEC. Significant incidents will be reported to the Karratha Regional Office of the DEC. Records of justified complaints will be forwarded to the Karratha Regional Office of the DEC within 48 hours of receiving a justified dust complaint.

10. Weeds and Feral Animals Management Plan

10.1 Description

Fourteen species of environmental weeds have been identified on the Burrup Peninsula (DEC 2008). Limited weed surveys have been undertaken on the Nickol Bay Quarry site; however some weeds were noted in a flora survey carried out for the mining proposal for General Lease areas (Umwelt 2007). Weeds were prevalent on the bunds adjacent to the operating quarry areas, but few weeds were observed away from the developed areas and vehicle tracks.

The most prevalent weed recorded on site was Buffel grass (*Cenchrus ciliaris*) (Umwelt 2007). Kapok bush (*Aerva javanica*) and Spiked malvastrum (*Malvastrum americanum*) were also recorded. The Environmental Weed Strategy for Western Australia rates weeds as high, moderate, mild or low according to their potential invasiveness, distribution and environmental impact. Buffel grass and Kapok bush are both rated as high, and have been noted as being weeds of greatest concern on the Burrup Peninsula (DEC 2008). Spiked malvastrum is currently rated as medium. None of these weeds are currently listed as 'declared species' under the *Agriculture and Related Resources Protection Act 1995* and no Declared Plants are recorded on the Burrup Peninsula (DEC 2008).

Buffel grass can reproduce either vegetatively or by seed, which is easily dispersed by wind, flood, and attachment to vectors. It responds vigorously to fire, not only rapidly regenerating after fire, but also increasing the spread of fires as it burns readily. It significantly alters environmental conditions when invading new habitats, and exudes chemicals that are toxic to other plants, leading to the loss of native species and changing the structure of vegetation communities, which can in turn impact fauna species. Buffel grass is most common where soils are disturbed, for example by off-road driving. Trudgen (2002) noted that Buffel grass was not a problem in rockpiles at the time of surveying, but required observation.

Kapok bush shows similar characteristics in its distribution to Buffel grass, and also favours areas of disturbance. This species has spread substantially on the Burrup Peninsula since the late 1970s.

Introduced animals that have been reported for the region and may visit the quarry site include cats (*Felis catus*), foxes (*Vulpes vulpes*), house mice (*Mus musculus*) and rats (*Rattus rattus*) (DEC2008).

10.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management in the control of weeds and feral animals:

- fire
- off-road vehicle movements
- human access
- site disturbance
- waste disposal.

10.3 Environmental performance objectives

Management objectives for weeds and feral animals are:

- to prevent the introduction of any new weed species onto the site
- to control existing weed populations on the site
- to ensure that quarry operations do not result in the spread of weeds within and beyond the site
- to control feral animals on the site.

10.4 Implementation strategy

10.4.1 Management actions

The following management actions will be implemented in order to meet the objectives of the Plan.

Table 23 Management actions for weeds and feral animals

Parameter	No	Action	Timing	Responsibility
WEEDS				
Surface material	WF1	Assess weed potential of surface material prior to removal.	Prior to clearing	Quarry Manager
	WF2	Store significantly weedy surface material separately to clean surface material	Surface material removal	Quarry Manager
	WF3	Stockpile all surface materials in the general vicinity of its origin.	Surface material removal	Quarry Manager
Hygiene measures	WF4	Clean all equipment coming onto the site from other areas prior to entry to remove weeds seeds and plant pathogens.	At all times	Quarry Manager
	WF5	Avoid moving surface material or fill material from weed infested areas to non-infested areas	At all times	Quarry Manager
Access	WF6	Control access within the project area to reduce the spread of weeds, especially off-road vehicle access, to prevent disturbance to vegetation and weed invasion.	At all times	Quarry Manager
	WF7	Provide signage to restrict personnel and/or vehicles from entering weed infested areas.	At all times	Quarry Manager
	WF8	Restrict access to areas outside the project area to reduce the spread of weeds into or out of the site	At all times	Quarry Manager
Eradication and control	WF9	Control environmental weed infestations, with a focus on new populations and those invading rockpiles.	At all times	Quarry Manager
	WF10	Control occurrences of weeds rated as 'high' according to the Environmental Weeds Strategy for Western Australia, which at the time of EMP preparation include Buffel grass and Kapok bush	At all times	Quarry Manager
	WF11	Apply herbicides for weed control suitable for the weed type being targeted, in accordance with the manufacturer's instructions	At all times	Quarry Manager
	WF12	Avoid the use of herbicides with a protracted half-life (greater than 1 year).	At all times	Quarry Manager
	WF13	Ensure herbicides are not be used close to watercourses or drains.	At all times	Quarry Manager
Further information	WF14	Conduct a weed survey of the site and adjacent conservation areas to enable informed strategic weed management strategies to be developed. Surveys should be undertaken in March to May, following the wet season and the results of the survey recorded and mapped. This information should be used to updated weed prioritisation lists and weed control programs	Within 6 months of the EMP becoming active, and each 3 years thereafter	Quarry Manager

Parameter	No	Action	Timing	Responsibility
Inductions and Training	WF15	Include weed hygiene measures, including cleaning, inspection and certification of equipment and locations of washdown facilities, as part of inductions and environmental awareness training for all contractors and staff.	As part of induction and environmental training of personnel and contractors	Quarry Manager
Fire	-	Implement fire management strategies provided in management actions FV13 – FV19 in Section 3, to prevent creating favourable conditions for weeds	At all times	Quarry Manager
Rehabilitation	-	Rehabilitate disturbed areas as they become available in accordance with the Preliminary Rehabilitation Plan (Section 14), including adequate control of weeds prior to revegetation.	During rehabilitation	Quarry Manager
FERAL ANIMALS				
Feral animals	WF16	Prohibit the feeding of all animals	At all times	All personnel
	WF17	Assist DEC with feral animal monitoring, trapping or research within tenements	A required	Quarry Manager
	-	Dispose of food scraps and other waste in the nominated onsite waste disposal bins in accordance with the Waste Management Plan (Section 11)	At all times	All personnel

10.4.2 Contingency actions

Table 24 Contingency actions for weeds and feral animals

Trigger	Action
Significant spread of weeds/ increase in weed numbers into areas that are not approved for vegetation clearing	<ol style="list-style-type: none"> 1. Determine cause 2. Implement appropriate weed control measures 3. Complete an Environmental Incident Report
New species of weed identified	<ol style="list-style-type: none"> 1. Identify weed and check its status under the Environmental Weed Strategy for Western Australia 2. Complete an Environmental Incident Report 3. Consult with DEC on best management measures to undertake in order to prevent weed from establishing and spreading within site
Feral animals found in the conservation areas	Investigate cause and possible mitigation measures in consultation with DEC

10.5 Monitoring and reporting

Monitoring

Table 25 provides monitoring actions to enable an assessment of the effectiveness of the weeds and introduced fauna management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager. A Weed Survey was undertaken in June 2011 (reporting finalised in September 2011) to satisfy action number WF14 in Table 23. Recommended monthly and quarterly inspection sites for weeds are also provided, and are illustrated in Figure 5.

Table 25 Monitoring actions for weeds and feral animals

Objective	Target	Description of monitoring	Monitoring record	Frequency/ timing
Monitor weed species	No new weed species establish on site	Identification of weed species within disturbed areas and access tracks (most likely places for initial appearance of new weeds) Recommended monthly inspection areas are sites S4, S11 and S12, and quarry operational areas (Figure 5).	Monthly inspection checklist	Monthly
Monitor weed infestations	No weed infestations in sensitive areas	Visual estimations of weed coverage within rock piles, conservation area, and rehabilitated areas (sensitive areas) Recommended quarterly inspection sites are sites S2, S8 and S13 (Figure 5).	Quarterly inspection checklist	Quarterly
Monitor feral animals	No increase in feral animals within conservation areas	Sightings of feral animals within operational areas and conservation areas	Quarterly inspection checklist	Opportunistically

Reporting

Internal reports will include details of formal and informal monitoring and observations and details of any weed control procedures undertaken, including location, type of control method used, date, meteorological conditions and weed species treated.

New weed species and significant increases in weed infestations or feral animals will be reported to DEC. Information regarding weeds and feral animals will be included in the Annual Progress and Compliance report submitted to DEC.

472000

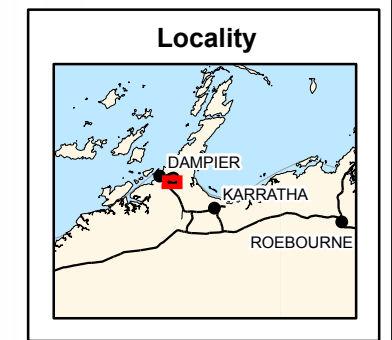
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info@strategen.com.au www.strategen.com.au

Scale

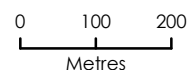


Figure 5 Weed survey site locations

Coordinate System: GDA 1994 MGA Zone 50
 Date: 12/09/2011
 User: atomeo
 Path: Q:\Consult\2010\HOL\HOL10151.01\ArcMap Documents\Nicko_Bay_Quarry_EMP\Figure 5 Tenements_Heritage_A3.mxd

Scale: 1:10,000 at A3
 Source: HOLCIM 5/2011
 Note that positional errors may occur in some areas

Legend

- April 2011 weed survey sites
- National Heritage Place
- Tenement Boundaries (DMP 5/04/2010)
- Conservation Areas (as agreed 15/02/2005)

Holcim Ref: NBQ-1109-05

11. Waste Management Plan

11.1 Description

Wastes generated on site include:

- general refuse
- waste from construction and operations
- fuels and oils (see Hydrocarbon Management Plan: Section 12)
- recyclables
- sewage and greywater.

11.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management to ensure waste does not negatively impact the environment.

- waste collection, storage and disposal
- disposal of contaminated soil, water and materials.

11.3 Environmental performance objectives

The purpose of this Management Plan is to ensure that the generation of all wastes during day to day operations adopts the principles of the waste hierarchy: reduction, reuse, recycling, treatment and disposal.

Liquid and solid wastes shall be managed in a manner which prevents impacts to local or regional groundwater and surface waters. Waste will also be managed to prevent potential health and hygiene problems.

Waste disposal requirements are controlled by licensing and general pollution provisions under the *Environmental Protection Act 1986* and applicable regulations. Sanitation requirements are required to meet the *Health Act 1911* and the *Occupational Health & Safety Act 1984*. Further information is provided in the Holcim Waste Guidelines for Quarries (SHE 4.2.6A).

The management objectives for waste are:

- to minimise waste generation
- to ensure all wastes are appropriately segregated and stored
- to minimise the risk of waste spills or leaks into the environment (to soil or water)
- to ensure safe waste removal from site to an appropriate final disposal destination.

11.4 Implementation strategy

11.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP

and reporting requirements will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 26).

Table 26 Management actions for waste

Parameter	No	Action	Timing	Responsibility
Information and education	W1	Include waste protocols in induction and training and make staff aware of issues affecting waste management and associated environmental impacts.	Induction and training of staff and contractors	Quarry Manager
	W2	Investigate and discuss opportunities for recycling or reuse at safety meetings.	At all times	Quarry Manager
Separation of wastes	W3	Segregate wastes into the following categories: <ul style="list-style-type: none"> • general refuse: includes putrescibles and inert wastes, such as kitchen scraps, wood, bricks, and concrete • general recycling: includes paper, plastic, cardboard, aluminium, glass • hazardous and dangerous wastes: includes flammable, ignitable, combustible, corrosive, toxic, acidic or alkaline materials • fuels and oily wastes (dealt with under Hydrocarbons MP) • sewage and wastewater 	At all times	Quarry Manager
General refuse	W4	Deposit general refuse into designated merrill or skip bins located on site Signpost bins to clearly indicate the nature of waste to be deposited.	At all times	Quarry Manager
	W5	Ensure bins have sturdy lids or cage tops to prevent animals from accessing the bins and to retain waste.	At all times	Quarry Manager
	W6	Ensure bins are emptied by licensed waste contractors	As required	Quarry Manager
	W7	Dispose of wastes offsite at the Karratha Landfill or alternatively at a licensed landfill site by a licensed contractor.	At all times	Waste contractor
Hazardous wastes	W8	Deposit hazardous wastes in designated waterproof merrill or skip bins located on site, separate from other materials. Signpost these bins to clearly indicate the nature of waste to be deposited.	At all times	Quarry Manager
	W9	Store wastes including flammable or combustible waste, corrosive waste, toxic waste or wastes which are also a dangerous good in accordance with the <i>Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007</i> .	At all times	Quarry Manager
	W10	Dispose of toxic and hazardous solids to a licensed disposal site for that purpose or as otherwise approved by the DEC.	At all times	Quarry Manager
Recyclable waste	W11	Segregate and stockpile recyclable materials such as scrap metal, obsolete or expired equipment (transformers, pumps, pipes), NiCad and FeCad batteries, electrical cable etc separately from other wastes to allow recycling or reuse.	At all times	Quarry Manager
	W12	Store empty drums in a designated hardstand area until collected for recycling.	At all times	Quarry Manager
All waste	W13	Store all waste in an area that will not contaminate any watercourse, waterway, groundwater, wetland or lake and soil.	At all times	Quarry Manager
	W14	Prohibit the disposal of waste on any Holcim site without appropriate statutory approvals and approval from the Environment Manager	At all times	Quarry Manager
	W15	Prohibit the burning of waste onsite.	At all times	Quarry Manager
Spills and leaks	W17	Remove and dispose of contaminated soil in accordance with the Holcim Environmental Emergency Procedure for liquid spills (SHE Guideline 4.2.7D).	As required	Quarry Manager
	W18	Contain any leakage from drums to prevent it entering waterways or contaminating soil.	As required	Quarry Manager

Parameter	No	Action	Timing	Responsibility
Sewerage	W19	Continue to direct sewage and grey water from the administration area to a series of septic tanks in series with sub-surface leach drains	At all times	Quarry Manager
	W20	Ensure the septic tanks are maintained and serviced by a registered contractor	As needed	Quarry Manager
Sediment/sludge	W22	Re-use recovered sediment/sludge from settling ponds on the site.	At all times	Quarry Manager
	W23	Ensure waste overburden/settling ponds fines do not accumulate in stockpiles to prevent them becoming a dust/erosion source.	At all times	Quarry Manager

11.4.2 Contingency actions

Table 27 Contingency actions for waste

Trigger	Action
Incorrect disposal of waste.	<ol style="list-style-type: none"> 1. Report as an Environmental Incident. 2. Implement corrective actions, including correct disposal of wastes and re-informing personnel of correct disposal procedures as required.
Spills/leaks	<ol style="list-style-type: none"> 1. Mitigate (initiate spill response procedure) and investigate cause 2. Report as an Environmental Incident. 3. Implement corrective actions, including correct disposal of wastes and re-educating personnel of correct disposal procedures as required.
Bins or waste facilities overflowing	<ol style="list-style-type: none"> 1. Arrange for more frequent waste collection and/or larger receptacles

11.5 Monitoring and reporting

Monitoring

Table 28 provides monitoring actions to enable an assessment of the effectiveness of the waste actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 28 Monitoring actions for waste

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
Monitoring of on-site waste disposal	Proper disposal of all domestic and industrial wastes (including putrescible wastes)	Visual observation of litter/rubbish within project area	Monthly inspection checklist	Monthly
Monitoring of on-site waste facilities	Suitable, effective function and condition (no corrosion) of all on-site waste facilities, including landfill and storage areas.	Visual inspection of design and condition of on-site waste facilities	Monthly inspection checklist	Monthly
Monitoring of separation of different waste categories	All bins and on-site waste facilities contain only wastes in the category designated for that bin, and are clearly sign posted	Visual observation of bin contents (where safe) at all on-site waste facilities, and of signage	Monthly inspection checklist	Monthly
Manage the liability associated with third party waste transport	All waste transported by a third party complies with regulatory requirements	Review Waste Transport Certificates to ensure they are up to date and complete	Monthly inspection checklist	Monthly
To account for the volume of waste generated and disposed of	Waste register is complete and accurate	Review the Waste Register to ensure all waste have been recorded	Monthly inspection checklist	Monthly

Reporting

An internal record of waste disposal shall be maintained on the Holcim Waste Disposal Register (SHE 4.2.6D). Records of the waste type, disposal method, contractor licence (if applicable), and disposal location shall be recorded. Where applicable, the Holcim Environmental Hazard Register and Action Plan (SHE 4.2.1A) shall be completed as part of internal reporting requirements.

The above information will also be included in the Annual Progress and Compliance report submitted to DEC.

Records of any incident that results in unacceptable waste management practices shall be reported under the Holcim Environment Incident Notification Form (SHE 5.1C/2). Records of environmental incidents with potentially to cause environmental harm will be reported to the Karratha Regional Office of the DEC in accordance with Condition G1(a) and (b) of Environmental Protection Licence 4741 (currently being amended to a site premises licence).

12. Hydrocarbons Management Plan

12.1 Description

Fuels and oils are predominantly used in the operation and maintenance of vehicles and machinery, with most activity involving fuels and oils occurring in the workshop and at the refuelling station.

The entry to the workshop consists of concrete hardstand and is graded to prevent stormwater entry into the workshop itself. A concrete bund around the perimeter of the workshop entry contains any spillage and aids in clean up of spills.

The designated refuelling pad is adjacent to the diesel storage tanks. The fuel storage tanks are designed and constructed (including bunding) to contain at least 110% of the capacity of the largest container) in accordance with Australian Standard *AS 1940-1993 The Storage and Handling of Flammable and Combustible Liquids* and requirements of the DMP Dangerous Goods Division and the *Explosives and Dangerous Goods Act, 1961*.

There are no chemical, fuel or waste oil underground tanks present on the quarry site. Hydrocarbons are stored within bunded storage areas, which have the following characteristics:

- graded or include a sump to allow recovery of liquid
- chemically resistant to the substances stored
- include valves, pumps and meters associated with transfer operations wherever practical or are adequately protected (e.g. Bollards) and contained in an area designed to permit recovery of chemicals released following accidents or vandalism
- designed so that jetting from any storage vessel or fitting will be captured within the bunded area (see for example Australian Standard 3780 – 1994 Section 5.7)
- designed such that chemicals which may react dangerously if they come into contact, are in separate bunds in the same compound or in different compounds
- controlled such that the capacity of the bund is maintained at all times (e.g. regular inspection and pumping of trapped uncontaminated rain water).

12.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management to minimise potential for contamination of the environment by hydrocarbons:

- hydrocarbon storage
- hydrocarbon spills
- disposal of contaminated of water and soil.

12.3 Environmental performance objectives

This management plan has been developed to comply with the *Environmental Protection Act 1986*, Sanitation the *Health Act 1911* and the *Occupational Health & Safety Act 1984*. Hydrocarbons will be stored in accordance with the *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations, 1992* prior to removal from site by a

licensed contractor in accordance with the *Environmental Protection (Controlled Waste) Regulations, 2004*.

The management objectives for hydrocarbons are:

- to ensure all hydrocarbons are appropriately segregated and stored
- to minimise the risk of hydrocarbon spills or leaks into the environment (to soil or water)
- to ensure safe hydrocarbon removal from site and appropriate final disposal destination.

12.4 Implementation strategy

12.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP and reporting requirements will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 29).

Table 29 Management actions for fuel and oils

Parameter	No	Action	Timing	Responsibility
Equipment maintenance	H1	Maintain and service all vehicles and mobile equipment including oil and coolant change-outs within the workshop, on the wash pad which has a Humesceptor to capture any hydrocarbons	At all times	Quarry Manager
	H2	Collect waste oils, spent solvents and coolants using mobile waste oil trays, and decant into a drum for collection and transport offsite by a licensed oil recycler, in accordance with the <i>Environmental Protection (Controlled Waste) Regulations, 2004</i> .	At all times	Quarry Manager
	H3	Maintain spill kits and absorbent material (pillows) at accessible locations within the workshop	At all times	Quarry Manager
	H4	Use groundsheets or drip trays to capture spillage during maintenance of machinery and vehicles	At all times	Quarry Manager
Refuelling	H5	Conduct re-fuelling over the designated refuelling pad with a sealed surface adjacent to the diesel storage tanks	During re-fuelling	All personnel
	H6	Operators remain with their vehicle at all times during the delivery of fuel to permit immediate response in the event of any spill or leakage.	During re-fuelling	All personnel
	H7	Maintain all refuelling equipment in good working order.	At all times	Quarry Manager
	H8	Install oil traps in refuelling areas to prevent any spilt fuel entering the drainage system.	At all times	Quarry Manager
Storage of hydrocarbons	H9	Store all hydrocarbons in a designated tank within a bunded area in accordance with Australian Standard 1940 and with the Holcim Bunding Guidelines (SHE 4.2.7A). Locate storage areas away from waterways and areas prone to flooding. Store diesel fuel or other liquid hydrocarbons within the designated fuel storage area.	At all times	Quarry Manager

Parameter	No	Action	Timing	Responsibility
	H10	Store all environmentally hazardous chemicals including hydrocarbons (where the total volume of each substance stored on the premises exceeds 250 litres) within low permeability (10-9 metres per second or less) compound(s) designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound, in accordance with AS 1940	At all times	Quarry Manager
	H11	Maintain and inspect bunded areas regularly. This includes: <ul style="list-style-type: none"> • checking and inspecting integrity of bunds • regular draining or pumping out accumulated stormwater from the bund and if contaminated stored in labelled containers • acting upon spills as soon as they are identified. • checking that release valves are in good order and not leaking. 	Weekly	Quarry Manager
Transport of hydrocarbons	H12	Collect labelled drums/containers containing contaminated liquids from pump out of bunds, and ensure these containers are transported by a licensed contractor in accordance with the <i>Environmental Protection (Controlled Waste) Regulations, 2004</i> to an oil recycling facility or other authorised waste facility	As required	Waste contractor
	H13	Collect separately contaminated soils, oily rags, hydrocarbons wastes and sludges and ensure disposal by an approved, licensed contractor in accordance with the <i>Environmental Protection (Controlled Waste) Regulations, 2004</i> .	As required	Waste contractor
Spills and leaks	H14	Manage hydrocarbon or other liquid chemical spillages in accordance with the Holcim Environmental Emergency Procedure for liquid spills (SHE 4.2.7D)	In the event of spill	All personnel
	H15	Ensure a documented spill response procedure is in place and employees are familiar with the procedure. Ensure incident reports are completed for all spills, spills are promptly cleaned up, and corrective actions undertaken to minimise potential for a similar event to occur in the future. Waste associated with the spill must be disposed of in accordance to local and state requirements.	At all times	Quarry Manager
	H16	Ensure spill response equipment is available and readily accessible in high-risk areas e.g. fuel storage areas	At all times	Quarry Manager
	H17	Replace spill response equipment after use.	At all times	Quarry Manager
	H18	Excavate and place any contaminated soil on an impervious area until a suitable disposal/remediation strategy is determined. Remediation procedures shall comply with the Holcim Site Contamination Policy and Risk Management Strategy (SHE 4.3A) and Holcim Phase I, II and III Site Contamination Assessment Guidelines (SHE 4.2.7B).	In the event of spill	Quarry Manager

12.4.2 Contingency actions

Table 30 Contingency actions for fuel and oils

Trigger	Action
Hydrocarbon spill.	<ol style="list-style-type: none"> 1. Initiate Incident Response Procedure, including : <ul style="list-style-type: none"> • control the source of the spill • contain the spill • clean up the spill 2. Complete Environmental Incident Report

12.5 Monitoring and reporting

Table 31 provides monitoring actions to enable an assessment of the effectiveness of the hydrocarbon management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 31 Monitoring actions for hydrocarbons

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
To identify unmanaged leaks and spills	Minor spills and leaks controlled, contained and cleaned up within 24 hours	Visual observation of re-fuelling area, soils and drainage system within site, to look for spills or other evidence of unmanaged hydrocarbon contamination	Weekly inspection checklist	During re-fuelling and any activities where leaks and spills may occur
To prevent large spills	No spills greater than 100 litres to occur on site at any time	Visual inspection of hydrocarbon storage and stationary re-fuelling facilities	Weekly inspection checklist	Weekly
To monitor condition of storage facilities	All storage tanks and pipelines in good working order with no deterioration/corrosion	Visual inspection of the condition and integrity of storage facilities and pipelines (check for leaks and deterioration/corrosion)	Weekly inspection checklist	Weekly and opportunistically
To monitor condition of spill response infrastructure and equipment	All bunds and spill response equipment present, stored correctly, and in good order at all times	Visual inspection of bunding and spill response equipment	Weekly inspection checklist	Weekly and opportunistically
To prevent incidents from the storage of incompatible substances e.g. fire, explosion	Hazardous materials / dangerous goods are appropriately segregated according to regulations	Inspect storage facilities to ensure that hazardous substances / dangerous goods are segregated appropriately	Monthly inspection checklist	Monthly

Reporting

Where applicable, the Holcim Environmental Hazard Register and Action Plan (SHE 4.2.1A) will be completed as part of internal reporting requirements.

An internal record of waste disposal will be maintained on the Holcim Waste Disposal Register (SHE 4.2.6D). Records of the waste type, disposal method, contractor licence (if applicable), and disposal location will be recorded. This information will be included in the Annual Progress and Compliance report submitted to DEC, along with records of environmental incidents.

Fuel/oil spillage outside bunded areas will be reported on the Holcim Environment Incident Notification Form (SHE 5.1C/2). Significant incidents (that may potentially lead to environmental harm) will be reported to the Karratha Regional Office of the DEC.

13. Surface Water Management Plan

13.1 Description

There is no naturally occurring permanent surface water on the quarry site or other Holcim tenements. Stormwater flow typically results in sheet flow during storm events. The natural drainage network receives water from the small catchments of the Pistol Ranges, and drainage across the site is to the south east.

There has been minimal alteration to natural surface water paths on the Holcim tenements. Drainage patterns have been modified in some areas to prevent flooding of infrastructure and operational areas of the quarry through the use of bunding. The main components of the mine site infrastructure impacting surface runoff are the access road, mine pit, ROM pad and haul roads. Bunds have also been used around quarry stockpiles to protect stockpiles from erosion, and minimise suspended sediment content of stormwater.

Surface water in quarry pits drains to an existing sump on M47/26. The sump has a capacity of approx 20,000 cubic metres. As water is a scarce resource in the region the sump water is utilised for processing and dust suppression. Scheme water provides the majority of water used onsite. Total site water usage is approximately 120 ML/year, depending on dust suppression and processing requirements during crushing.

The quarry pit does not intersect any aquifers so does not require dewatering. The water table in the quarry is about 2 metres below the quarry base (4m AHD), as confirmed by blast hole groundwater level measurements (URS 2008).

A Groundwater Management Plan is not considered necessary for Nickol Bay Quarry, as there is no intersection of aquifers through quarry operations, and no groundwater abstraction. Surface water management provides pollution and contamination control measures which also provide groundwater protection.

13.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management to ensure protection of surface water values:

- water recycling and reuse
- stormwater drainage potentially leading to erosion and contamination of watercourses.

13.3 Environmental performance objectives

This Surface Water Management Plan has been prepared to ensure that ongoing site activities do not result in negative impacts to surface water within and surrounding the project area. The plan has been developed to fulfil the conditions and commitments prescribed under Ministerial Statement 713 (Appendix 1), as well as to meet the objectives of conditions prescribed in the site Environmental Protection Licence No 4741 (currently being amended to a 'premises' licence).

The management objectives for surface water are:

- to minimise disturbance to natural surface drainage patterns of the area.
- to minimise the potential for erosion.

- to maintain water quality of surface water
- to capture stormwater runoff within the pits for use in dust suppression and processing.

13.4 Implementation strategy

13.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP and reporting will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 32).

Table 32 Management actions for surface water

Parameter	No	Action	Timing	Responsibility
Stormwater	SW1	Allow clean stormwater from non-process areas and access roads in the plant area to infiltrate into the surrounding soil	At all times	Quarry Manager
	SW2	Collect Stormwater from the roofs in galvanised steel gutters or through external down pipes directly discharged into soakage pits or storage tanks.	At all times	Quarry Manager
	SW3	Disperse stormwater drainage from unsealed roads onto surrounding areas	At all times	Quarry Manager
	SW4	Install culverts on haul road crossings over drainage lines to prevent the disruption of drainage paths, with sufficient capacity to accommodate one in one hundred year floods.	At all times	Quarry Manager
Erosion control	SW5	Use existing access tracks or roads wherever possible rather than creating new ones.	At all times	Quarry Manager
	SW6	Design haul roads and ramps in the pit area to follow existing contours where possible, and avoid steep slopes which increase runoff velocity which may lead to erosion.	At all times	Quarry Manager
	SW7	Keep natural drainage lines open wherever possible.	At all times	Quarry Manager
	SW8	Construct approaches to drainage centres to minimise gully erosion and drainage interference.	At all times	Quarry Manager
	SW9	Provide adequate erosion control structures on sloping ground such as spur drains or contour banks at suitable intervals.	At all times	Quarry Manager
Vehicle washdown	SW10	Conduct all vehicle washdown and cleaning in the designated washdown facility.	At all times	Quarry Manager
	SW11	Direct detergent or solvent contaminated waters from the vehicle wash down area via a drain to a sediment sump in series with an oily water separator. Maintain and inspect the sediment sump in accordance with the Holcim weekly, monthly and quarterly Environmental Inspection Checklist (Appendix 4).	At all times	Quarry Manager
	SW12	Arrange transport of hydrocarbons collected in the separators offsite by a licensed contractor, in accordance with the <i>Environmental Protection (Controlled Waste) Regulations, 2004</i> .	At all times	Quarry Manager
	SW13	Prevent discharge of treated or untreated washdown waters from the facility, except in the case of extreme rainfall events.	At all times	Quarry Manager
Water recycling	SW14	Recycle process water and settling pond water for dust suppression, washing and promoting revegetation etc.	At all times	Quarry Manager
Surface water contamination wastes	-	Ensure that management actions to prevent solid and liquid wastes from contaminating surface water resources are detailed in the Waste Management Plan (Section 11).	At all times	Quarry Manager

Parameter	No	Action	Timing	Responsibility
Surface water contamination hydrocarbons	-	Implement management actions to prevent fuels and oils from contaminating surface water resources are detailed in the Hydrocarbon Management Plan (Section 12).	At all times	Quarry Manager

13.4.2 Contingency actions

Corrective action will be implemented as necessary, in accordance with the Holcim Incident Reporting and Investigation Guidelines (SHE 5.1)

Table 33 Contingency actions for surface water

Trigger	Action
Flooding or ponding occurring on-site	<ol style="list-style-type: none"> 1. Investigate cause 2. Modify the on-site drainage management system as required. 3. Complete an Environmental Incident Report
Integrity of on-site drainage management system compromised	<ol style="list-style-type: none"> 1. Investigate cause. 2. Modify the on-site drainage management system as required. 3. Complete an Environmental Incident Report
Discharge/runoff water quality does not meet relevant standards (e.g. for sediment content or hydrocarbons) - Water quality objectives provided in Holcim Stormwater management guidelines (SHE 4.2.4B)	<ol style="list-style-type: none"> 1. Immediately cease affected discharge. 2. Investigate cause and report as Environmental Incident 3. Undertake treatment as required. 4. Review environmental incidents relating to water quality (e.g. hydrocarbon spills). 5. Review relevant environmental procedures (e.g. hydrocarbon spill procedures). 6. Review the need for personnel training (e.g. in spill procedures). 7. Complete an Environmental Incident Report

13.5 Monitoring and reporting

Table 34 provides monitoring actions to enable an assessment of the effectiveness of the surface water management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Monitoring of performance against the measures described in the EMP will be undertaken in accordance with the Holcim weekly, monthly and quarterly Environmental Inspection Checklist (Appendix 4).

Table 34 Monitoring actions for surface water

Objective	Target	Description of monitoring	Monitoring record	Frequency/ timing
To monitor surface water quality	Surface water meets quality guidelines	Water quality monitoring of sump water or water from other relevant locations in the vicinity of a spill.	Weekly inspection checklist	Six monthly and after a spill incident or other indication that water may be contaminated or of low quality.
To monitor surface water quantity and movement	No flooding or ponding of surface water	Visual observation of all parts of the drainage management system within the operational area.	Monthly inspection checklist	Monthly and opportunistically.

Reporting

Records of environmental incidents and water quality will be included in the Progress and Compliance Reports to DEC. Significant incidents will be reported to the Karratha Regional Office of the DEC in accordance with Condition G1 (a) and (b) of Environmental Protection Licence 4741.

Records of any incident that included the loss of chemicals, fuel, oil or other hydrocarbons to the environment will be reported using the Holcim Environment Incident Notification Form (SHE5.1C/2). Where applicable, the Holcim Environmental Hazard Register and Action Plan (SHE 4.2.1A) shall be completed as part of internal reporting requirements.

14. Preliminary Rehabilitation Management Plan

14.1 Description

This preliminary Rehabilitation Management Plan contains basic rehabilitation management protocols, and will provide for management while the full Progressive Rehabilitation Program is in development, in compliance with Statement 713. The Progressive Rehabilitation Plan for the site will provide further details of rehabilitation initiatives and will include expected schedules for achieving the staged rehabilitation of the site.

A Decommissioning Plan will also be developed closer to the time of project closure to deal with removal of buildings and structures and final landform and rehabilitation in line with designated subsequent land use.

Rehabilitation will be progressive over the life of the quarry. Surface material is stockpiled before quarrying activities begin, and returned after shaping or landscaping of quarried areas. Revegetation is then undertaken to restore the appearance of the sites, prevent soil erosion and encourage fauna back to the area. In general, the availability of surface material area is limited on the Nickol Bay quarry site.

14.2 Environmental aspects to be managed

The following aspects of the Nickol Bay Quarry operation have been identified as requiring management to ensure successful rehabilitation:

- vegetation clearing
- surface material handling and storage
- stormwater drainage
- weed spread
- revegetation.

14.3 Environmental performance objectives

Regulatory agencies and industry bodies have established guidelines (industry best-practice) to assist quarrying companies to achieve acceptable standards of quarry closure and rehabilitation. Whilst there is no legislative requirement to adhere to these guidelines, Holcim subscribe to the intent and advice of such guidelines. Industry best-practice guidelines include the following key documents:

- Department of Minerals and Energy (1994), 'Environmental Management of Quarries: Development, Operation and Rehabilitation Guidelines'
- Australian and New Zealand Minerals and Energy Council (ANZMEC) and Mineral Council of Australia (MCA) (2000), 'Strategic Framework for Mine Closure'
- Chamber of Minerals and Energy (2000), 'Mine Closure Guidelines for Mineral Operations in Western Australia'.

A series of guideline handbooks has also been developed by Environment Australia to outline best practice methods for the rehabilitation of various activity areas of a mine. These may be used in addition to the above information, where practical. Key Acts, which are relevant to

the rehabilitation of mine sites, are the *Mining Act 1978* and the *Environmental Protection Act, 1986*.

This plan details management procedures to rehabilitate disturbed areas during and following operation of the Nickol Bay Quarry. This plan has been prepared in order to address the commitments made under the Public Environmental Review document for the Western Extension and Ministerial Statement 713 (Appendix 1) as well as applicable Mining Lease conditions (Appendix 2).

The management objectives for preliminary rehabilitation are:

- to rehabilitate disturbed areas as soon as practicable to minimise dust, erosion, and sedimentation of stormwater, and to maximise success of rehabilitation
- to ensure vegetation clearing methods, surface material removal methods, and storage procedures maximise the success of subsequent rehabilitation
- to re-establish a stable, erosion-resistant, land surface conducive to plant establishment and with appropriate drainage patterns, that requires minimal ongoing maintenance and management
- to emulate the pre-quarry environment of the area in rehabilitation activities as far as possible, with post-rehabilitation landforms that blend in with natural landforms in adjacent areas, and with a self-sustaining system of native species that are similar in diversity, density and cover to pre-disturbance conditions.

14.4 Implementation strategy

14.4.1 Management actions

The following management actions will be implemented in order to meet the objectives of the Plan.

Table 35 Management actions for rehabilitation

Parameter	No	Action	Timing	Responsibility
General	PR1	Conduct rehabilitation of disturbed areas on a progressive basis throughout the life of the project. Undertake rehabilitation as soon as possible after operations in an area are complete.	At all times	Quarry Manager
	PR2	Survey areas of disturbance to be rehabilitated and record the size and location on a site plan for future monitoring.	Pre-rehabilitation	Quarry Manager
Access	PR3	Clearly sign areas undergoing rehabilitation (e.g. “ <i>Area Under Rehabilitation</i> ”) to notify site personnel.	At all times	Quarry Manager
	PR4	Install fencing or barriers at appropriate points along roads to prevent vehicle access.	At all times	Quarry Manager
Landform	PR5	Develop a final landform plan conforming to the relevant DMP guidelines for each disturbed area, considering slope and stability of the areas to be rehabilitated	Pre-rehabilitation	Quarry Manager
	PR6	Shape pit walls to create a stable and safe landform.	During rehabilitation	Quarry Manager

Parameter	No	Action	Timing	Responsibility
	PR7	Rehabilitate residual product stockpiles and overburden dumps upon the completion of each dump structure. Batter structures to achieve a stable landform with an overall slope not exceeding 20o.	During rehabilitation	Quarry Manager
	PR8	Deep rip (approximately 1m) on contours to reduce erosion, reduce flow velocities, promote water capture/infiltration, and promote soil binding. Carry out shallow ripping as required.	During rehabilitation	Quarry Manager
	PR9	Rehabilitate the visible section of the upper bench of the south facing quarry slopes in the western extension by battering the quarry faces to an approximate 1:1 slope.	During rehabilitation	Quarry Manager
Surface material	PR10	Directly return surface material to available disturbed areas and spread to a minimum depth of 100mm	After landform finalisation	Quarry Manager
	PR11	Use surface material as soon as possible after collection so as to avoid storage for more than six months.	After landform finalisation	Quarry Manager
Weed control	PR12	Conduct weed control prior to planting or seeding of native plants	Pre-revegetation	Quarry Manager
Habitat	PR13	Place logs, branches and other vegetative debris in small piles (0.5m to 1m high) at random locations across the rehabilitation areas to act as temporary habitat for fauna whilst rehabilitation progresses.	During revegetation	Quarry Manager
Revegetation	PR14	Ensure revegetation is by direct seeding, and natural re-colonization by local species	During revegetation	Quarry Manager
	PR15	Consult specialist seed supply organisations to determine the appropriate native seed mix, method and rate of application. Trials may be required to test the viability of the seed of various species on-site. Ensure seed mix is comprised of local species only and will include native grasses (to provide initial stabilization), nitrogen fixing plants, and other local species consistent with the original (arid adapted) vegetation of the area. Use results of vegetation surveys completed to date as part of the Consultative Environmental review, PER and other local and regional studies to guide revegetation outcomes. Use wherever possible, locally collected seed for revegetation	During revegetation	Quarry Manager
	PR16	Conduct direct seeding immediately prior to the onset of rainfall in the wet season (December to March) to maximise establishment rates.	Onset of wet season	Quarry Manager
	PR17	Include Priority species <i>Brachychiton acuminatus</i> and <i>Terminalia supranitifolia</i> where possible in rehabilitated areas.	During revegetation	Quarry Manager
Infrastructure	PR18	Rehabilitate roads when they are no longer required. Remove culverts and drains and re-contour the roads to reinstate the natural drainage patterns. Re-spread available surface material deep rip the surface profile and conduct direct seeding.	End of use	Quarry Manager
	PR19	Remove equipment and infrastructure that is no longer required from the site. Excavate and bury concrete footings in a suitable location.	End of use	Quarry Manager
	PR20	Formulate the rehabilitation of the laydown area in the Final Decommissioning Plan to be completed prior to project completion.	End of use	Quarry Manager
Non-operations areas	PR21	Ensure areas of informal vehicle tracks or other disturbance are appropriately defined, controlled for weeds, and allowed to self-colonise with native species, supplemented with direct seeding if necessary.	At all times	Quarry Manager

14.4.2 Contingency actions

Table 36 Contingency actions for rehabilitation

Trigger	Action
Plants not growing back	<ol style="list-style-type: none"> 1. Investigate cause 2. If cause is environmental, alter the rehabilitated area in the appropriate manner to increase hospitality to plants e.g. alter drainage, undertake weed control

Trigger	Action
Weed invasion	<ol style="list-style-type: none"> 1. Investigate reasons for weed infestation 2. Undertake weed control 3. Implement appropriate actions to prevent further weed infestations in the area
Erosion	<ol style="list-style-type: none"> 1. Investigate cause 2. Apply appropriate management measures e.g. creation of bunds, addition of brush to exposed areas, re-ripping
Surface material has been in stockpiles for more than 6 months	<ol style="list-style-type: none"> 1. Undertake testing to determine seed viability and the suitability of soil structure and composition for rehabilitation purposes. 2. Undertake soil amendment measures will before use in rehabilitation if required

14.5 Monitoring and reporting

Monitoring

Table 37 provides monitoring actions to enable an assessment of the effectiveness of the rehabilitation management actions in place. Responsibility for implementing the monitoring program, achieving compliance with the EMP and reporting will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

Table 37 Monitoring actions for rehabilitation

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
To Monitor for erosion within rehabilitation areas	Retention of sufficient topsoil to enable successful revegetation	Assess physical stability of rehabilitated areas (e.g. erosion) at selected (permanent) monitoring points within each rehabilitation area	Quarterly inspection checklist	Quarterly
To monitor progress of revegetation	Vegetation cover equal to surrounding undisturbed areas.	Assess the structure and health of vegetation communities in rehabilitated areas at selected permanent monitoring points within each rehabilitation area	Quarterly inspection checklist	Quarterly
To monitor drainage characteristics of rehabilitation areas	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas	Assess the water drainage characteristics of the site at selected (permanent) monitoring points within each rehabilitation area	Quarterly inspection checklist	Quarterly
To monitor weeds in rehabilitated areas	No declared weed species within rehabilitation areas Weed cover not increasing within rehabilitation areas	Assess the characteristics of weeds, including weed spread, level of infestation, and any new species at selected (permanent) monitoring points within each rehabilitation area	Quarterly inspection checklist	Quarterly (for weed cover target compare to same time the previous year)

Reporting

An internal record of areas disturbed, earthworks or rehabilitated will be maintained and updated following ongoing site surveys.

All rehabilitation efforts undertaken on granted tenements will be described and reported in Annual Environmental Reports submitted to DMP. Adherence to the EMP including this Rehabilitation Management Plan will be detailed in the Annual Progress and Compliance Report submitted to the DEC.

Part C Management framework

15. Environmental Management system

The Holcim Environmental Management System forms part of the overall Holcim Australia Safety, Health and Environment (SHE) Management Framework. The SHE Management Framework is structured around five standards:

- Standard 1 Policy, planning and process
- Standard 2 People
- Standard 3 Risk management: Safety and health
- Standard 4 Risk management: Environment
- Standard 5 Measure review and improve

The SHE Environmental Management System (Standard 4) has been developed to provide consistency in environmental management across all Holcim operations. The EMS structure and framework is founded on the principles of AS/NZS ISO 14001:2004. The EMS provides information and resources that will assist continuous improvement in the level of environmental performance of operations.

Each standard within the SHE Management Framework is made up of a set of guidelines. The guidelines for Standard 4 (Risk management: Environment) are as follows:

- 4.1 Permits, Licences and Approvals
- 4.2 Environmental Hazards and Operating Procedures
 - 4.2.1 Hazard Identification
 - 4.2.2 Operating Practices
 - 4.2.3 Air Emissions
 - 4.2.4 Water management
 - 4.2.5 Noise
 - 4.2.6 Management of wastes
 - 4.2.7 Land Protection, Management and Rehabilitation
- 4.3 Engineering and Due Diligence
- 4.4 Energy and Resource Conservation
- 4.5 Right-to-Know Reporting
- 4.6 Community awareness
- 4.7 Objectives, Targets and Performance Indicators

The EMS focuses on the operational control of significant environmental aspects (hazards) of operations, which have been identified on a generic basis following the process flow of each business type. Environmental hazards for hard rock quarries are documented in section 4.2.1B (1) of the SHE system.

A set of minimum environmental standards has been developed for each environmental hazard. Environmental standards for hard rock quarries are documented in section 4.2.2A (1) of the SHE system. The intent of these standards is reflected in the specific management measures described in this EMP. Standards are used to measure environmental performance over time and operations are assessed against the requirements of these standards to determine where improvements are required.

Figure 6 provides an overview of the structure of the SHE Environmental Management System.

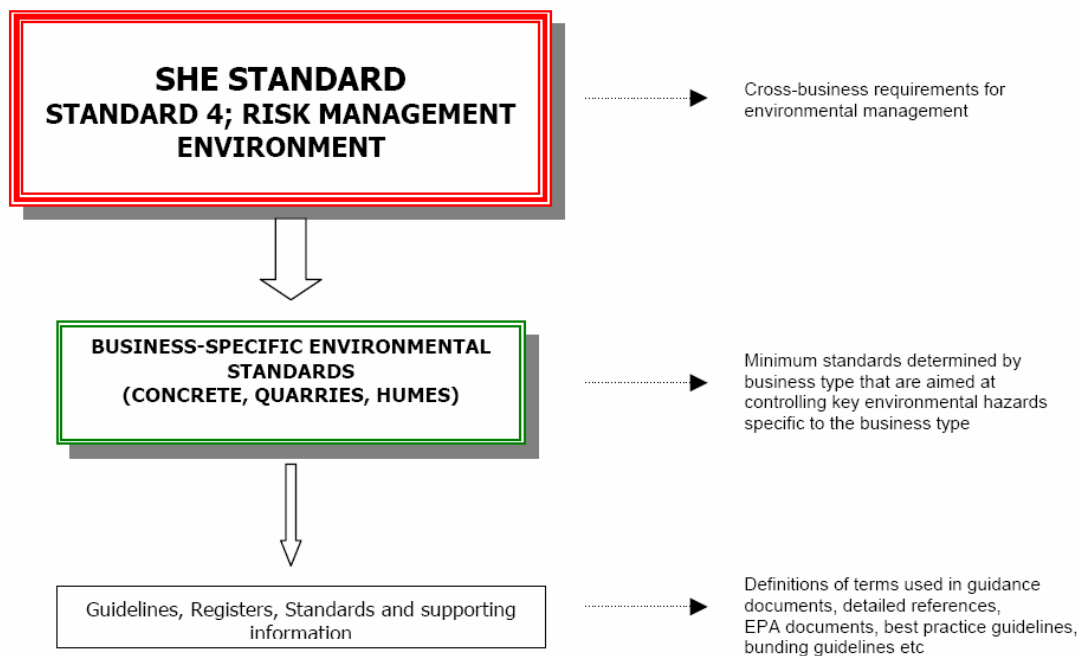


Figure 6 SHE Environmental Management System

15.1 Communications and training

15.1.1 Internal communications

Internal communications methods may include the following, as applicable:

- meetings
- project reports
- performance assessments reports
- notice boards
- onsite personnel inductions, training and toolbox sessions (as required)
- sub-contractor coordination meetings.

These mechanisms will be used to address concerns and questions raised by quarry personnel and any incidents (environmental and general) that may have occurred. In addition, these mechanisms will be used to communicate any new environmental management procedures or information to ensure effective implementation. S HE Guideline 2.1 provides further information regarding communication.

15.1.2 External Communications

External communications may include the following, as applicable:

- meetings and correspondence with appropriate regulatory authorities and stakeholders
- discussions and consultation with adjoining land managers
- consultation with representatives of local Aboriginal groups and Native Title claimants
- handling of, and responding to, stakeholder complaints or requests.

See also Section 15.2 relating to the Nickol Bay Quarry stakeholder consultation.

15.1.3 Induction and training

All employees shall receive suitable environmental training, to ensure they are aware of their responsibilities and are competent to carry out their work in an environmentally acceptable manner. Environmental requirements shall be explained to all onsite personnel during a site induction. Ongoing instruction and knowledge update opportunities shall be provided via toolbox meetings. Inductions and ongoing instruction shall be recorded.

Site Induction

All staff and employees, including subcontractors, will attend a site specific environmental induction before commencement of any work on the site. Attendance at the induction process will be formally recorded.

The environmental induction will include the following items:

- explanation of the purpose and objectives of the EMP
- overview of environmental issues relevant to the project including cultural heritage
- roles and functions of personnel onsite in relation to environmental management procedures including individual's responsibilities
- potential consequences of departure from procedures
- emergency procedures and responses
- identification of legal obligations.

Induction requirements for each factor are provided in the management action tables within this EMP.

Training

The Quarry Manager will ensure all staff and supervisory personnel performing duties required by this EMP are properly briefed. Where a training need is identified, arrangements will be made for such appropriate training to be facilitated. Raising environmental awareness

through training of relevant staff will be conducted with focus on the following aspects as relevant to the operator's role:

- areas of environmental significance
- areas of heritage significance
- protection of flora and fauna – priority flora, weeds, fire control, specially protected fauna
- management of noise and vibration
- management of dust
- surface and groundwater protection
- waste management
- visual amenity
- complaints response procedures
- spill response and incident management and reporting
- community awareness.

Current staff and contractors at Nickol Bay Quarry will be trained in the relevant environmental aspects within 6 months of issue of this EMP.

Assessment and Training of Subcontractors

The environmental requirements of the subcontract or package will be defined in the procurement documentation, and provided to the applicant during pre-award negotiations.

All subcontractors will receive environmental training/briefing, either as a part of initial site induction or in addition to initial site induction

Subcontractors will be monitored by the Quarry Manager or other delegated nominee to ensure environmental procedures are being correctly followed, and that environmental performance is consistent with the EMP.

15.2 Stakeholder consultation

The Nickol Bay Quarry is fairly remote, and is located away from population centres and residences. Organisations and businesses in the area include the Nickol Bay Speedway Club to the south-east of the quarry, the Sporting Shooters Association of Australia (Nickol Bay Branch) to the east, and Hanson Construction Materials Limited to the south-west.

Stakeholder consultation for Nickol Bay Quarry operations has included:

- The Shire of Roebourne
- Nickol Bay Speedway Club
- Sporting Shooters Association of Australia (Nickol Bay Branch)
- Nickol Bay Naturaliste Club
- Hanson Construction Materials Limited

- Aboriginal groups and representatives
- Government departments

In response to information provided to stakeholders regarding proposed developments within General Purpose Leases, comments were received from the Speedway Club and the Sporting Shooters Association relating to concern about possibility of damage to underground water pipes, common use roads, and electricity supply infrastructure. Full details of comments can be found in Mining Proposal (2007).

In light of the formal recognition of the cultural and heritage significance of the Burrup Peninsula through the National Heritage listing in 2007 significant efforts have been made, and will continue to be made, to consult with the local indigenous groups regarding the cultural heritage surrounding the Nickol Bay Quarry.

A Community Consultation Plan will be a component of the Progressive Rehabilitation Plan (in development). SHE Guideline 4.6 provides a good corporate neighbour guide and a community liaison checklist

Public complaint resolution

Public complaints are to be dealt with according to the Environmental Complaint Response Procedure and Register (SHE Guideline 4.6a).

15.3 Monitoring and compliance

The monitoring programs specific to each factor are provided within the individual management plans that comprise this EMP.

In addition, a Compliance Planner (Appendix 5) has been developed to provide a site audit protocol for compliance and monitoring against the key management actions and NBQ permit requirements.

15.4 Reporting

There is a requirement under Mining Tenement Conditions for a brief annual report of operations and rehabilitation undertaken in the previous 12 months and plans for the next 12 months.

Progress and Compliance Reports will be submitted to DEC Audit Branch in accordance with Condition 5-1 of Ministerial Statement 713 (Appendix 1).

An Annual Environmental Report (AER) will also be submitted to the DMP on an annual basis, based on the *Guidelines for the Preparation of an Annual Environment Report* (DMP, 2010). An annual Compliance Report will be prepared as outlined in Ministerial Statement 713, with the report submitted to the DEC (Appendix 1). A Performance Review will be conducted every five years and submitted to DEC, as per Ministerial Statement 713.

No annual reporting is required under the Environmental Protection Licence (No 4741/9) (currently being amended to a 'premises' licence) for the site. Notwithstanding this, any incident, accident or malfunction at the premises with potential to adversely affect the environment will be reported to the DEC Karratha Regional Office within 24 hours stating:

- the nature and cause of the incident

- the date and time of the incident
- the potential source of harm
- the completed or proposed control/mitigation actions
- the expected corrective and preventative actions
- ongoing monitoring (if any).

Holcim will continue to estimate and report annually on relevant emissions prescribed under the National Pollutant Inventory. This reporting requirement is also ratified under the SHE Guideline for “Right to know reporting” (SHE 4.5).

Internal reporting

Internal reporting is to be carried out according to Standard 5 of the SHE Guidelines.

Environmental incident reporting

Environmental Incidents are events or occurrences that result in, or have the potential to result in, adverse affects on the environment, for example:

- unauthorised clearing of vegetation
- spill of hydrocarbons
- unauthorised disturbance to an Aboriginal Heritage site.

All incidents will be reported, recorded and investigated as per the criteria applicable to the severity of the incident. Incidents will be tracked to ensure that the appropriate corrective actions and preventative measures are taken to prevent the incident from re-occurring. Environmental incidents will be reviewed on an annual basis to determine incident trends and addressed at management meetings. This will enable targeting of areas that require further management and will assist in preventing future incidents.

All incidents will be reviewed immediately to determine if they require reporting to the appropriate authority. If reporting is required, it will be carried out in writing to the appropriate authority within the agreed timeframe.

Environmental incident reporting has not been included in each individual management plan as the same procedure applies to all environmental incidents. SHE Guideline 5.1 provides further details of incident reporting, recording and investigation. An Emergency Response Plan will be implemented to deal with any major environmental incidents.

15.5 Auditing

An Audit Program in accordance with condition 5-1 of Ministerial Statement 713 has been developed for the Nickol Bay Quarry (Appendix 6).

The Audit Program can be used by the Department of Environment and Conservation to assess the environmental performance of the Nickol Bay Quarry project against its conditions, procedures and proponent commitments as detailed in Ministerial Statement 713.

The SHE system includes several levels of audits for quarry operations including:

- technical services environmental and compliance audit

- self audits (6 monthly)
- external environmental audits (3 yearly).

Where requirements contained within the standards are not met an action plan will be developed which:

- sets out the actions required to meet the standards
- nominates people responsible to complete the action items
- specifies when these actions will be complete.

Regular surveillance

Quarry Managers will carry out day to day surveillance of all relevant activities to ensure they are being undertaken in accordance with the requirements of this EMP. Any non-adherence will be recorded on the weekly, monthly and quarterly Environmental Inspection Checklist (Appendix 4). Where applicable, environmental checks will utilise the Operation Emission Checklist (SHE 4.2.3A)

Internal Inspections and Auditing

Where necessary, Quarry Manager(s) will ensure that identified environmental monitoring and/or inspection items are incorporated into pro-forma 'Inspection Checklists' and will also ensure that such inspections and any monitoring measurements are carried out by an appropriately trained and/or briefed person. Such inspections will confirm that Project Programs and Procedures containing environmental controls are being implemented.

Internal audits will be scheduled on a regular basis in accordance with the Holcim Safety, Health and Environment (SHE) Management System. Reference to the Holcim Instructions for Self Assessment (SHE 5.3) shall be made which describes annual internal auditing requirements and procedures to determine the status of implementation of the site Environmental Management System.

Internal inspections will be undertaken by Holcim staff or qualified consultants no more than four weeks prior to a Compliance Audit by an independent organisation to ensure that the company is complying with the environmental criteria and procedures specified in this EMP.

Compliance Audits

Formal compliance audits will normally be undertaken by an independent organisation to ensure the works complies with the appropriate environmental legal requirements and the EMP. Such compliance audits are expected to occur every three years.

The STARS database will be used to record details of visits by regulatory authorities where the authority has left documented notice of the visit, whether or not that notice demands any action (SHE Guidance 5.1.6)

Audit Close Out

Any non-compliance detected will be resolved and/or closed out. Triggers for non-compliance include:

- failure to carry out specific management actions within the individual management plans
- failure to meet specified monitoring requirements
- breach of any condition within applicable licences and or approvals
- breach of conditions as specified in heritage agreements with traditional owners.

The Quarry Manager will ensure that non-compliance events are identified on a Corrective and Preventative Action form, with such Action Plans being closed out within the prescribed time frame. Corrective action will be implemented, in accordance with the Holcim Incident Reporting and Investigation Guidelines (SHE 5.1).

Performance reporting will be implemented to produce systematic, comprehensive and informative reports on the environmental management and monitoring activities at the Nickol Bay Quarry. Internal audits of compliance with environmental management commitments and conditions required as part of the proposal will also be undertaken.

Where auditing finds environmental management actions are not being effective, the auditors may recommend changes to procedures. Furthermore, the DEC Audit Branch is likely to undertake regular audits to assess compliance with all relevant conditions and commitments.

15.6 Review and revision

In accordance with the principles of AS/NZS ISO 14001, the above Environmental Management System (EMS) documentation will be:

- easily located and logically filed in hard copy and electronic copy form including date of issue.
- available for all relevant project personnel
- periodically reviewed and revised as necessary by authorised personnel
- removed from all points of issue when superseded by revised documents.

This EMP shall be reviewed as required throughout the duration of the project, in response to changes in legislative requirements and changes in regulatory and corporate requirements, environmental initiatives and operational regimes. In addition, continuous improvement of the plan will occur in response to environmental incident resolutions, audit findings, and monitoring results. Quarterly environmental inspection forms (SHE 4.2.2F) include a scheduled review of the EMS

Upon review, the document shall be revised and re-issued where appropriate. DEC will be advised of any minor changes to the plan and provided with the revised document. Major changes will not be undertaken without prior consultation with DEC.

16. References

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Trudgen, M.E 2002 A flora, vegetation and floristic survey of the Burrup Peninsula, some adjoining areas and parts of the Dampier Archipelago with comparisons to the floristics of areas on the adjoining mainland (Volume 1). Report prepared for the Department of Mineral and Petroleum Resources, Perth

Umwelt 2007 Nickol Bay Quarry Mining Proposal General Purpose Leases and Miscellaneous Lease flora and vegetation survey. Report prepared for Readymix, Perth.

URS 2008 Progress Report: Preliminary Assessment of Groundwater Supply for Nickol Bay Quarry. Report prepared for Holcim Australia

Appendix 1

Statement 713



GOVERNMENT OF WESTERN AUSTRALIA

OFFICE OF THE MINISTER FOR THE ENVIRONMENT; SCIENCE

General Manager
Readymix Holdings Pty Limited
PO Box 555
VICTORIA PARK WA 6979

Dear Sir / Madam

**HARD ROCK QUARRY, BURRUP PENINSULA, DAMPIER
(Assessment No. 1377)**

The Minister for the Environment has issued a statement that the above proposal may be implemented subject to the conditions contained in that statement (copy attached).

The statement does not remove requirements for you to obtain other statutory approvals. Additionally, please note the duties of a proponent provided for in section 47 of the *Environmental Protection Act 1986*.

As proponent you have the right to appeal against the conditions in the statement within fourteen days of the date of publication.

Following that period and determination of any appeal, and at the request of the Minister, I will advise the decision-making authorities that they may exercise their decision-making powers.

At the request of the Minister, I will issue that advice earlier on receiving written confirmation that you accept the conditions and waive your right of appeal.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'Darren Walsh'.

Darren Walsh
APPEALS CONVENOR

Att

24 JAN 2006



**STATEMENT THAT A REVISED PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

HARD ROCK QUARRY – ML 47/26, 255, 306, 309, 331, 333 & 353
BURRUP PENINSULA

Proposal: The Nickol Bay Quarry is situated on Mining Leases M47/26, M47/255, M47/306, M47/309, M47/331, M47/333 and M47/353, and the infrastructure on General Purpose leases G47/23 and G47/42, located in the Pistol Range near Dampier, approximately 13 kilometres west of Karratha in the Shire of Roebourne.

The revised proposal is for the extension of the existing quarry westwards on Mining Lease M47/333 in addition to the previously approved eastern extension on Mining Leases M47/306, M47/309, M47/331 and M47/353. The proposal is documented in schedule 1 of this statement.

Proponent: Readymix Holdings Pty Limited

Proponent Address: PO Box 555, VICTORIA PARK WA 6979

Assessment Number: 1377

Previous Assessment Number: 902

Previous Statement Number: 440

Report of the Environmental Protection Authority: Bulletin 1170

Previous Report of the Environmental Protection Authority: Bulletin 834

The conditions and procedures of this statement supersede the conditions and procedures of Statement No. 440 in accordance with section 45B of the *Environmental Protection Act 1986*.

The revised proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions and procedures of this statement.

Published on

24 JAN 2006

2 Proponent Commitments

- 2-1 The proponent shall implement the environmental management commitments documented in schedule 2 of this statement.

3 Proponent Nomination and Contact Details

- 3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.
- 3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.
- 3-3 The nominated proponent shall notify the Department of Environment of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

- 4-1 The proponent shall substantially commence mining in the western pit extension within five years of the date of this statement or the approval for that extension granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the extension proposal has been substantially commenced.

- 4-2 The proponent shall make application for any extension of approval for the substantial commencement of the western pit extension beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 4-1.

The application shall demonstrate that:

1. the environmental factors of the proposal have not changed significantly;
2. new, significant, environmental issues have not arisen; and
3. all relevant government authorities have been consulted.

Note: The Minister for the Environment may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the western pit extension.

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environment which address:

1. the status of implementation of the proposal as defined in schedule 1 of this statement;
2. evidence of compliance with the conditions and commitments; and
3. the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environment is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

5-2 The proponent shall submit a performance review report every five years after the publication of this statement, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, which addresses:

1. the major environmental issues associated with implementing the project; the environmental objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those objectives;
2. the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;
3. significant improvements gained in environmental management, including the use of external peer reviews;
4. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and
5. the proposed environmental objectives over the next five years, including improvements in technology and management processes.

6 Environmental Management Plan

6-1 Prior to commencement of operations in the western extension, the proponent shall update the Environmental Management Plan for the quarry, to include operations in the western extension, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land

Management, the Department of Industry and Resources and the Department of Indigenous Affairs.

The objectives of this Plan are:

- to provide a systematic framework with environmental performance objectives for environmental management of the quarry; and
- to achieve the environmental performance objectives.

This Plan shall address the following:

1. Management of declared rare and priority flora and vegetation communities;
2. Management of threatened and priority fauna;
3. Management of operations to reduce visual impact;
4. Aboriginal heritage management;
5. Noise management;
6. Dust management;
7. Control of weeds and introduced animal species;
8. Management of fuels and oils;
9. Surface water management; and
10. Conceptual closure plan.

6-2 The proponent shall implement the Environmental Management Plan required by condition 6-1.

6-3 The proponent shall make the Environmental Management Plan required by condition 6-1 publicly available.

7 Management of Areas Withdrawn from Quarrying Plans

7-1 Within six months following the issuing of the notice to the decision-making authorities under section 45(7) of the *Environmental Protection Act 1986*, the proponent shall prepare a Management Plan to prevent quarry-related impacts on vegetation in the areas withdrawn from quarrying plans as shown in figure 3 of schedule 1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

7-2 The proponent shall implement the Management Plan required by condition 7-1.

7-3 The proponent shall make the Management Plan required by condition 7-1 publicly available.

8 Progressive Rehabilitation Programme

8-1 Within three years following the issuing of the notice to the decision-making authorities under section 45(7) of the *Environmental Protection Act 1986* and prior to the commencement of mining within Mining Lease M47/333, the proponent shall prepare a Progressive Rehabilitation Programme for the quarry and associated infrastructure located within Mining Leases M47/26, M47/255, M47/306, M47/309, M47/331, M47/333 and M47/353 and General Purpose leases G47/23 and 47/42 incorporating:

1. proposed final land use, rehabilitation objectives and completion criteria;
2. method and management of progressive rehabilitation of mined pit faces, pit floors and other areas in order to protect visual amenity; and
3. the sequence and indicative timetable for the rehabilitation of quarry pit floors, pit faces and other disturbed areas within the leases, and relocation of rock stock piles, waste dumps and other quarry infrastructure into disused quarry pits,

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

8-2 In the development of the Progressive Rehabilitation Programme required by condition 8-1, the proponent shall prepare and implement a consultation plan to identify important stakeholders and the method/s of consultation to be employed in the development of the Programme, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

8-3 The proponent shall make copies of the Progressive Rehabilitation Programme required by condition 8-1 publicly available upon request by any person.

8-4 The proponent shall implement the Progressive Rehabilitation Programme required by condition 8-1.

8-5 The proponent shall review the Progressive Rehabilitation Programme required by condition 8-1 at intervals not exceeding five years, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

9 Decommissioning

9-1 The proponent shall carry out the satisfactory decommissioning of the quarry, removal of the plant and installations and rehabilitation of the site and its environs.

9-2 At least six months prior to decommissioning, and within six months following any four-year period of stoppage of quarrying activity, the proponent shall prepare a Final Decommissioning and Rehabilitation Plan to achieve the objectives of conditions 8-1 and 9-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

- 9-3 The proponent shall implement the Final Decommissioning and Rehabilitation Plan required by condition 9-2.

Procedures

1. Placement of Tenement Conditions on Mining Leases

With the proponent's consent, the Minister for State Development will place the following two tenement conditions on mining leases ML47/255, ML47/306, ML47/309, ML47/331, ML47/333 and ML47/353:

Condition 1: No mining (quarrying) activities are to be undertaken in the areas which have been deemed to have high environmental significance as shown on figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005 and signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99.

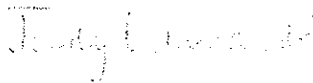
Condition 2: Any proposal for exploration activities in the areas which are deemed to have a high environmental significance as shown on figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005, signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99, needs to be referred to the Environmental Protection Authority under section 38 of the *Environmental Protection Act 1986*.

The conditions will be placed on the leases after approval by the Department of Industry and Resources of the Notice of Intent "Public Environmental Review, Western Extension to Nickol Bay Quarry (Mining Lease M47/333) Burrup Peninsula, Dampier" dated 2002.

2. Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will provide that advice to the Department of Environment for the preparation of written notice to the proponent.
3. The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment.
4. Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environment.

Notes

1. The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment over the fulfilment of the requirements of the conditions.
2. The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.



Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT; SCIENCE

24 JAN 2006

Schedule 1

The Proposal (Assessment No. 1377)

The Nickol Bay Quarry is situated on Mining Leases M47/26, M47/255, M47/306, M47/309, M47/331, M47/353 and M47/333; and General Purpose leases G47/23 and G47/42 on the Burrup Peninsula, near Dampier, Shire of Roebourne (see figure 1 - Location plan). The revised proposal is for the extension of the existing quarry westwards on Mining Lease M47/333 in addition to the eastern extension on Mining Leases M47/306, M47/309, M47/331 and M47/353 over a period of approximately 20 years.

The proposal is described in the Public Environmental Review (2002), as modified during the assessment and by the proponent's letter of 15 February 2005 and also in the Consultative Environmental Review (1994) and Supplement to the Consultative Environmental Review (1996), as modified by the proponent's letter of 24 October 1996, where the 1994 and 1996 documents are not inconsistent with the 2002 and 2005 documents.

Operations at the quarry include quarrying of rock suitable for crushing for aggregate, quarrying of armour rock and crushing of rock. Facilities include offices, laboratory, workshop, weighbridge, fuel and oil storage areas and stockpiles (see figure 2 - Site layout plan).

During the course of the assessment of the western extension to the quarry, the proponent committed to removing four areas contained in Mining Leases M47/255, M47/306, M47/309, M47/331, M47/333 and M47/353 from future quarrying plans and managing these areas to prevent quarrying-related damage to vegetation. The areas are shown in figure 3.

The Key Proposal Characteristics are shown in table 1.

Table 1 – Key Proposal Characteristics (1377)

Element	Quantities/Description
Mining Leases	M47/26, M47/255, M47/306, M47/309, M47/331, M47/333 and M47/353
General Purpose Leases (for infrastructure)	G47/23 and G47/42
Life of project (mine production)	At least 20 years
Size of total rock reserve (eastern and western extension)	Approximately 15.8 million tonnes
Maximum depth of quarry pits	Approximately 75 metres
Maximum area of disturbance (eastern and western extension)	Approximately 21 hectares
Quarrying times	Continuous operation on a project by project basis
Quarrying rate	Up to 1 million tonnes per annum
Drainage	All surface runoff will be drained to the existing sump on adjoining mining lease M47/26.
Quarry access	Via existing quarry access on adjoining mining lease M47/26.
Major components: <ul style="list-style-type: none"> • pits • processing plant, including stockpiles • infrastructure 	<p>The quarry comprises the original quarry area, the eastern extension area and the western extension area.</p> <p>Processing plant comprises crushing and screening equipment.</p> <p>Offices, laboratory, workshop, weighbridge, fuel and oil storage areas.</p>

Figures (attached)

Figure 1 – Location plan

Figure 2 – Site layout plan

Figure 3 – Areas to be removed from quarrying plans

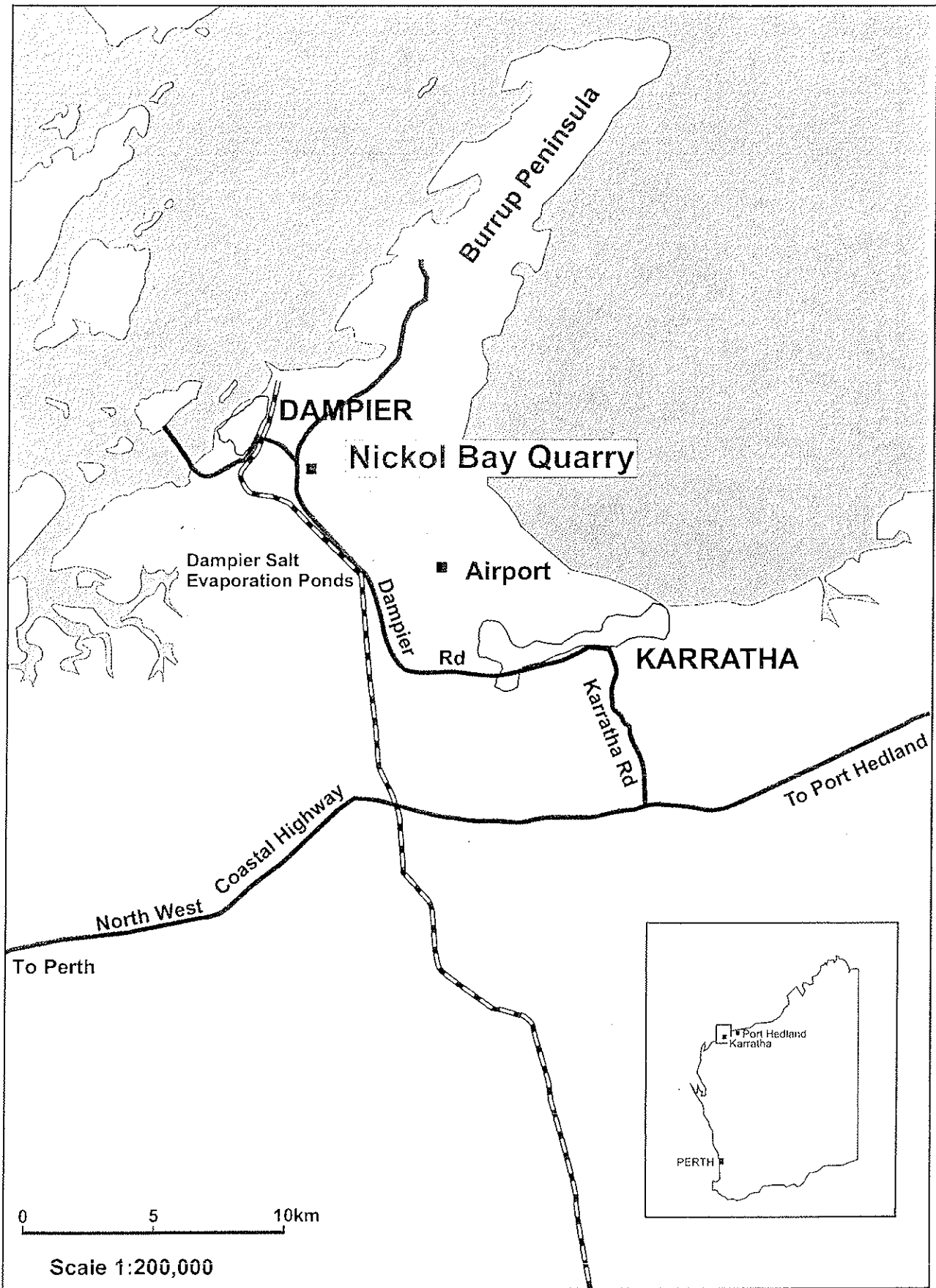


Figure 1: Location plan

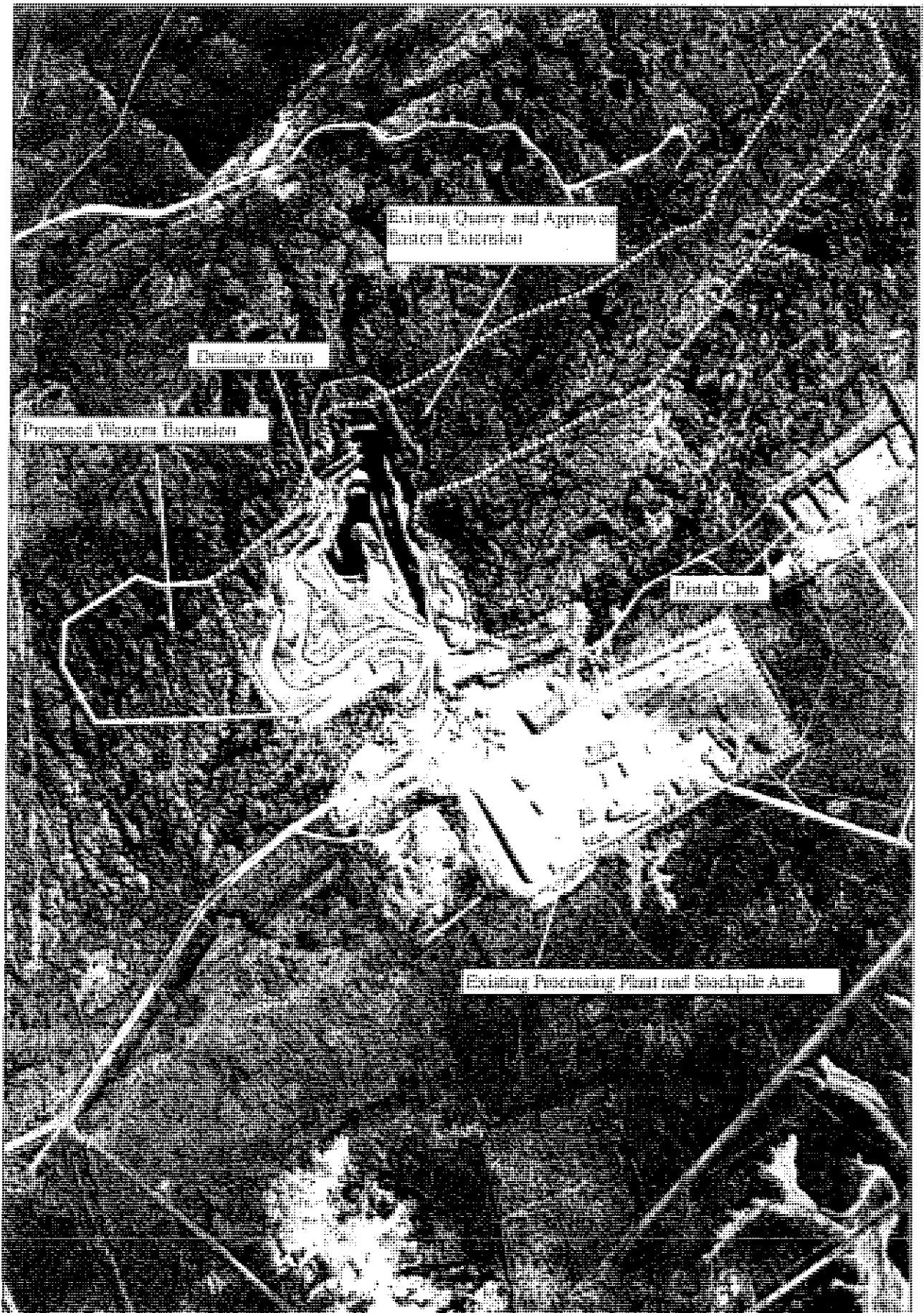


Figure 2 – Site layout plan

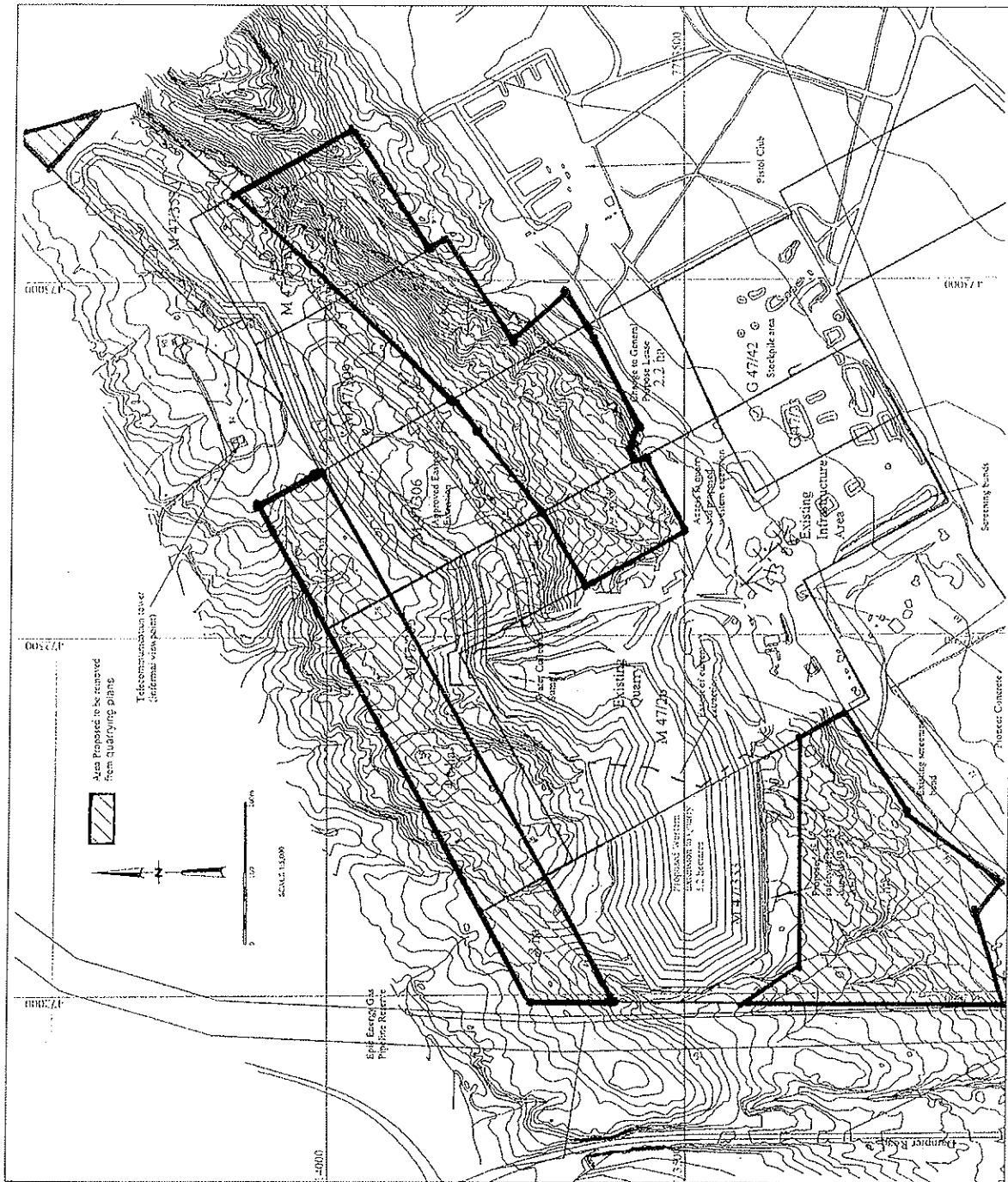


Figure 3: Areas to be removed from quarrying plans

Proponent's Environmental Management Commitments

of 1996, as revised in December 2005

**Hard Rock Quarry
ML 47/26, 255, 306, 309, 331, 333 & 353
Burrup Peninsula
Shire of Roebourne**

(Assessment 1377)

Readymix Holdings Pty Limited

Schedule 2

Proponent's Environmental Management Commitments (revised December 2005)

HARD ROCK QUARRY – ML 47/26, 255, 306, 309, 331, 333 & 353, BURRUP PENINSULA (Assessment No. 1377)

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the 'action' to be undertaken by the proponent;
- the objective of the commitment;
- the timing requirements of the commitment; and
- the body/agency to provide technical advice to the Department of Environment.

No.	Topic	Action	Objective	Timing	Advice
1	Future expansion	Withdraw areas shown in figure 3 of schedule 1 from potential future quarrying plans.	To retain these areas for vegetation conservation.	Prior to commencement of mining of western extension	
2	Visual Amenity	Rehabilitate the upper bench of the south-facing quarry slopes which are visible from the plain by: <ol style="list-style-type: none"> 1. Reducing the finished visible faces to a maximum 1:1 slope. 2. Covering the reduced slopes with reddish brown coloured rocks and topsoil. 3. Encouraging establishment of vegetation (mainly <i>Triodia</i> (spinifex) species). 4. Seeding topsoiled areas with local seed if recolonisation is not progressing adequately within 18 months. 5. Meeting with the Department of Conservation and Land Management annually for five years to assess rehabilitation progress and options. 	To reduce the visual impact of the western quarry extension.	During operation of the quarry	Department of Conservation and Land Management

No.	Topic	Action	Objective	Timing	Advice
3	Visual Amenity	Construct the southern part of the quarry safety bund to heights of up to 2.5 metres.	To reduce the extent of the quarry faces visible from the plain.	During operation of the quarry	
4	Visual Amenity	Construct the visible part of the quarry safety bund with reddish brown coloured rocks and topsoil.	To blend in with the existing landscape.	During operation of the quarry	
5	Visual Amenity	Review the feasibility of relocating existing plant and stockpiles to within the quarry pit, and re-locate plant/stockpiles if practicable.	To reduce visual impact of the quarry.	Annually	
6	Rehabilitation and Decommissioning	Develop a detailed Rehabilitation and Decommissioning Plan. (See conditions 8 and 9).	To progressively rehabilitate and decommission the quarry to a standard consistent with the long-term land use.	Within 3 years following approval for the western extension, or prior to commencement of the western extension, whichever is the sooner.	Shire of Roebourne Department of Industry and Resources
7	Rehabilitation and Decommissioning	Implement the Rehabilitation and Decommissioning Plan referred to in commitment 6. (See conditions 8 and 9).	To achieve the objectives of the decommissioning plan.	During and post-operation	Department of Industry and Resources
8	Clearing of Vegetation.	Restrict clearing of vegetation to a practical minimum.	To minimise vegetation disturbance.	During operation of the quarry.	



**APPEALS CONVENOR
ENVIRONMENTAL PROTECTION ACT 1986**

General Manager
Readymix Holdings Pty Limited
PO Box 555
VICTORIA PARK WA 6979

Dear Sir / Madam

**HARD ROCK QUARRY, BURRUP PENINSULA, DAMPIER
(Assessment No. 1377)**

I note that you did not lodge an appeal against the amended conditions contained in the statement that the Minister for the Environment issued for the above proposal.

At the request of the Minister, I have advised the decision-making authorities that they may now exercise their powers with respect to the proposal.

Please address future correspondence relating to the implementation of this proposal to:

Manager
Environmental Audit Section
Department of Environment
PO Box K822
PERTH WA 6842

Yours faithfully

Darren Walsh
APPEALS CONVENOR

13 FEB 2006

Appendix 2

Tenement Conditions



Our ref: Registration ID: 26598
Enquiries: Phil Boglio (08) 9222 3664
Email: Phil.BOGLIO@dmp.wa.gov.au

The Registered Manager
Holcim (Australia) Pty Ltd
18 Brodie Hall Drive
BENTLEY WA 6102

Attention: Holly Pantelias

Dear Madam

APPROVAL FOR MINING PROPOSAL NICKOL BAY QUARRY ACCESS ROAD ON TENEMENTS L47/91

REGISTRATION ID: 26598

I refer to your Mining Proposal dated 7 April, 2010, for a Quarry Access Road on Miscellaneous Licence 47/94, which has been assessed by this Department. The document satisfies the Schedule of Conditions attached to L47/91.

The bonds currently held for these tenements are sufficient for this operation.

Approval is hereby given to commence development and operation of the project in accordance with tenement conditions. However, this does not remove the need for any necessary approvals from other authorities.

I advise that I intend to recommend to the Minister responsible for the *Mining Act 1978* that he impose further conditions on L47/91 under the provisions of section 46A of the *Mining Act 1978*. A schedule of further conditions is **attached**.

It should be noted that the approvals hereby given relate only to environmental issues and do not in any way relate to safety. With respect to safety, you are reminded of your obligation to carry out the mining operation in accordance with the provision of the *Mines Safety and Inspection Act 1994* and Regulations 1995.

Please note that this letter does not constitute a Clearing Permit under Part V Division 2 of the *Environmental Protection Act 1986* for clearing of native vegetation. A Clearing Permit must be gained independently through the Native Vegetation Assessment Branch of the Department of Mines and Petroleum if required.

Should you have any queries regarding this letter or the recommended conditions, please contact Phil Boglio on (08) 9222 3664.

Yours faithfully

Ian Briggs
ACTING DIRECTOR
ENVIRONMENT DIVISION

27 May 2010

Attach: Recommended Further Conditions

cc: *HOLCIM (AUSTRALIA) PTY LTD C/- TENEMENT ADMINISTRATION SERVICES*
LEVEL 2, 326 HAY STREET
EAST PERTH WA 6004

**RECOMMENDED FURTHER CONDITIONS
FOR MISCELLANEOUS LICENCE 47/91**

Please add the following new Conditions:

20. Please add the following bullet point/document to condition 20:

- *"Holcim Nickol Bay Quarry Low Impact Mining Proposal L47/91"* (Reg ID 26598) dated 12 April 2010 signed by Holly Pantelias, and retained on Department of Mines and Petroleum file no. *(to be advised)*.

Where a difference exists between the above document and the following conditions, then the following conditions shall prevail:

22. The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.
23. All topsoil and vegetation being removed ahead of all mining operations and being stockpiled appropriately for later respreading or immediately respread as rehabilitation progresses.
24. At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environment Division, DMP.
25. All rubbish and scrap is to be progressively disposed of in a suitable manner.
26. Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Director, Environment, DMP for his assessment and until his written approval to proceed has been obtained.

Conditions – G47/23 as at 31/03/2009

		Start Date	End Date
Endorsements			
1	The grant of the lease being confined to the natural surface of the land and thereunder to a depth of 15 metres.	20/02/1992	
2	The Lessee's attention is drawn to the Minister's requirement that the holder of this Lease lodge security in the form of an Unconditional Performance Bond for due compliance with environmental conditions in the sum of: <ul style="list-style-type: none"> • \$28,000 	31/03/2009	

Conditions

1	Survey	20/02/1992	
2	Compliance with the provisions of the Aboriginal Heritage Act, 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.	20/02/1992	
3	No development or construction being commenced until the lessee has submitted a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.	12/08/2005	
	No development or construction being commenced until the lessee has submitted a plan of proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.	20/02/1992	11/08/2005
4	Such further conditions as may from time to time be imposed by the Minister for Minerals and Energy to deal with the prevention or reduction of dust nuisance.	20/02/1992	
5	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled:	31/03/2009	

Conditions

- ""Nickol Bay Quarry, Mining Proposal, General Purpose Leases Development" (MP 5868) dated 7 September 2007, signed by Georgia Manning and letter titled 'Re: Mining Proposal for General Lease Development at Nickol Bay Quarry (MP 5868)'" dated 20 December 2007 signed by Georgia Manning and retained on Department of Mines and Petroleum File No. E0191/200501.

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

- 6 The lessee submitting to the Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in:
- 31/03/2009
- August.

Conditions – G47/42 as at 31/03/2009

		Start Date	End Date
Endorsements			
1	The grant of the lease being confined to the natural surface of the land and thereunder to a depth of 15 metres.	01/07/1993	
2	The Lessee's attention is drawn to the Minister's requirement that the holder of this Lease lodge security in the form of an Unconditional Performance Bond for due compliance with environmental conditions in the sum of: <ul style="list-style-type: none"> \$96,000 	31/03/2009	
Conditions			
1	Survey.	01/07/1993	
2	Compliance with the provisions of the Aboriginal Heritage Act, 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.	01/07/1993	
3	No development or construction being commenced until the lessee has submitted a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.	12/08/2005	
	No development or construction being commenced until the lessee has submitted a plan of proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.	01/07/1993	11/08/2005
	Consent to mine on Temporary Reserve 5461H given subject to:-	01/07/1993	
4	Cancellation of the Lease without compensation, upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.	01/07/1993	
5	The construction and operation of the project and measures to	31/03/2009	

Conditions

protect the environment being carried out generally in accordance with the document titled:

- "Nickol Bay Quarry, Mining Proposal, General Purpose Leases Development" (MP 5868) dated 7 September 2007, signed by Georgia Manning and letter titled "Re: Mining Proposal for General Lease Development at Nickol Bay Quarry (MP 5868)" dated 20 December 2007 signed by Georgia Manning, and retained on Department of Mines and Petroleum File No. E0191/200501.

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

6	The lessee submitting to the Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: <ul style="list-style-type: none">• August.	31/03/2009	
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Conditions – G47/47 as at 31/03/2009

		Start Date	End Date
Endorsements			
1	The lessee's attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	30/01/2008	
2	The grant of the lease being confined to the natural surface of the land and thereunder to a depth of 15 metres.	30/01/2008	
3	The lessee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	30/01/2008	
4	The grant of this Lease does not include land the subject of Cinders Road Reserve and any land south of Cinders Road Reserve .	30/01/2008	
5	The Lessee's attention is drawn to the Minister's requirement that the holder of this Lease lodge security in the form of an Unconditional	31/03/2009	

Endorsements

Performance Bond
for due compliance
with environmental
conditions in the
sum of:

- \$81,000

Conditions

1	Survey.	30/01/2008	
2	The lessee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment and written approval prior to commencing any development or construction.	30/01/2008	
	Consent to mine on Temporary Reserve 5461H and Borrow Pit Sand Reserve 38616 granted subject to:	30/01/2008	
3	Cancellation of the licence without compensation, upon notice in writing from the Minister for State Development that the ground within this tenement or any portion thereof is required for public purposes or industrial development	30/01/2008	
4	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: <ul style="list-style-type: none"> • "Nickol Bay Quarry, Mining Proposal, General Purpose Leases Development" (MP 5868) dated 7 September 2007, signed by Georgia Manning and letter titled "Re: Mining Proposal for General Lease Development at Nickol Bay Quarry (MP 5868)" dated 20 December 2007 signed by Georgia Manning, and retained on Department of Mines and Petroleum File No. E0191/200501. 	31/03/2009	
Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.			
5	The lessee submitting to the Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: <ul style="list-style-type: none"> • August. 	31/03/2009	

Conditions – G47/48 as at 31/03/2009

		Start Date	End Date
Endorsements			
1	The lessee's attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	30/01/2008	
2	The grant of the lease being confined to the natural surface of the land and thereunder to a depth of 15 metres.	30/01/2008	
3	The lessee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	30/01/2008	
4	The Lessee's attention is drawn to the Minister's requirement that the holder of this Lease lodge security in the form of an Unconditional Performance Bond for due compliance with environmental conditions in the sum of: <ul style="list-style-type: none"> \$35,000 	31/03/2009	

Conditions

1	Survey.	30/01/2008	
2	The lessee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment and written approval prior to commencing any development or construction.	30/01/2008	
3	Mining on any road, road verge or road reserve being confined to below a depth of 15 metres from the natural surface.	30/01/2008	
4	No interference with the transmission line or the installations in connection therewith, and the rights of ingress to and egress from the facility being at all times preserved to the owners thereof.	30/01/2008	
Consent to mine on Temporary Reserve 5461H granted subject to:		30/01/2008	
5	Cancellation of the licence without compensation, upon notice in writing from the Minister for State Development that the ground within this tenement or any portion thereof is required for public purposes or industrial development	30/01/2008	
6	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled:	31/03/2009	

Conditions

- "Nickol Bay Quarry, Mining Proposal, General Purpose Leases Development" (MP 5868) dated 7 September 2007, signed by Georgia Manning and letter titled "Re: Mining Proposal for General Lease Development at Nickol Bay Quarry (MP 5868)" dated 20 December 2007 signed by Georgia Manning, and retained on Department of Mines and Petroleum File No. E0191/200501.

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

7	The lessee submitting to the Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: <ul style="list-style-type: none">• August.	31/03/2009	
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Conditions – G47/171 as at 31/03/2009

		Start Date	End Date
Endorsements			
1	The lessee's attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	30/01/2008	
2	The grant of the lease being confined to the natural surface of the land and thereunder to a depth of 15 metres.	30/01/2008	
3	The lessee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	30/01/2008	
4	The Lessee's attention is drawn to the Minister's requirement that the holder of this Lease lodge security in the form of an Unconditional Performance Bond for due compliance with environmental conditions in the sum of: <ul style="list-style-type: none"> • \$55,000 	31/03/2009	
Conditions			
1	Survey.	30/01/2008	
2	The lessee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment and written approval prior to commencing any development or construction.	30/01/2008	
3	Mining on any road, road verge or road reserve being confined to below a depth of 15 metres from the natural surface.	30/01/2008	
4	No interference with the transmission line or the installations in connection therewith, and the rights of ingress to and egress from the facility being at all times preserved to the owners thereof.	30/01/2008	
	Consent to mine on Temporary Reserve 5461H granted subject to:	30/01/2008	
5	Cancellation of the licence without compensation, upon notice in writing from the Minister for State Development that the ground within this tenement or any portion thereof is required for public purposes or industrial development	30/01/2008	
	Consent to Mine on Industrial Development Reserve No. 49120 given on the 4 March, 2008.	04/03/2008	
6	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled:	31/03/2009	

Conditions

- "Nickol Bay Quarry, Mining Proposal, General Purpose Leases Development" (MP 5868) dated 7 September 2007, signed by Georgia Manning and letter titled "Re: Mining Proposal for General Lease Development at Nickol Bay Quarry (MP 5868)" dated 20 December 2007 signed by Georgia Manning, and retained on Department of Mines and Petroleum File No. E0191/200501.

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

- 7 The lessee submitting to the Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: 31/03/2009
- August.

Conditions – L47/91 as at 31/03/2009

Endorsements	Start Date	End Date
1	The Licensee's attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	22/02/2008
2	The Licensee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	22/02/2008

Conditions

1	The Licensee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment and written approval prior to commencing any development or construction.	22/02/2008
2	Wherever any part of a road intersects an existing fence, the holder shall where necessary construct a gate or livestock grid having such dimensions and be constructed of such materials and be of such standard as agreed with the pastoralist or as determined by the Inspector.	22/02/2008
3	The road to be constructed using proper materials to suit the purpose for which it is being constructed, and further that it be constructed in a workman like manner and further that it be constructed to the satisfaction of the District Inspector of Mines.	22/02/2008
4	The holder shall maintain the road from time to time as shall be	22/02/2008

Conditions

	required to ensure that it is safe for the purpose that it is constructed.		
5	The road is to be clearly signposted as a private road and the signposting is to be regularly maintained at the licence holder's expense.	22/02/2008	
6	All traffic on the road must give way to traffic on public roads	22/02/2008	
7	All intersections with public roads should be at 90 degrees or as close as possible to maintain visibility and such intersections are to be maintained at the licence holder's expense.	22/02/2008	
8	Truck warning signs must be installed at a distance of 200 metres both north and south (or east and west as the case requires) of any intersection, to warn traffic on public roads of entering traffic from the road.	22/02/2008	
9	The licensee is to obtain the written approval of the Shire of Roebourne or Main Roads WA or both where applicable and lodge a copy of that approval with the Mining Registrar prior to the construction of that part of the road that will intersect with any existing road. Where a difference exists between DoIR conditions and the requirements of either authority, the requirements of the authority prevail.	22/02/2008	
10	No mining within 25 metres of either side of the Dampier to Perth Gas/Petroleum pipeline without the prior written consent of the State Mining Engineer.	22/02/2008	
11	No surface excavation approaching closer to the boundary of the Safety Zone established by condition 10 hereof than a distance equal to three times the depth of the excavation without the prior written approval of the State Mining Engineer, DoCEP.	22/02/2008	
12	No interference with the drainage pattern, and no parking, storage or movement of equipment or vehicles used in the course of mining within the Safety Zone established by Condition 10 hereof without the prior approval of the operators of the Gas/Petroleum pipeline.	22/02/2008	
13	The Licensee shall not excavate, drill, install, erect, deposit or permit to be excavated, drilled, installed, erected or deposited within the Safety Zone established in Condition 10 hereof, any pit, well, pavement, foundation, building, or other structure or installation, or material of any nature whatsoever without the prior written consent of the State Mining Engineer, DoCEP.	22/02/2008	
14	No explosives being used or stored within one hundred and fifty (150) metres of the Gas/Petroleum pipeline without the prior written consent of the State Mining Engineer, DoCEP.	22/02/2008	
15	Mining on the Safety Zone established in Condition 10 hereof being confined to below a depth of 50 metres from the natural surface unless otherwise approved by the State Mining Engineer, DoCEP.	22/02/2008	
16	The rights of ingress to and egress from the pipeline easement established in Condition 10 hereof being at all times preserved	22/02/2008	

	Conditions for employees, contractors and agents of the operators of the Gas/Petroleum pipeline.		
17	Such further conditions as may from time to time be imposed by the Minister responsible for the Mining Act 1978 for the purpose of protecting the Gas/Petroleum pipeline.	22/02/2008	
18	The prior written consent of the Minister responsible for the Mining Act 1978 being obtained before commencing any activities in respect to the licence purposes on Industrial Development Reserve No. 49120.	22/02/2008	04/03/2008
	Consent to mine on Temporary Reserve 5461H granted subject to:	22/02/2008	
19	Cancellation of the licences without compensation, upon notice in writing from the Minister for State Development that the ground within this tenement or any portion thereof is required for public purposes or industrial development.	22/02/2008	
	Consent to mine on Industrial Development Reserve No. 49120 granted on 4 March 2008.	04/03/2008	
20	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: <ul style="list-style-type: none"> "Nickol Bay Quarry, Mining Proposal, General Purpose Leases Development" (MP 5868) dated 7 September 2007, signed by Georgia Manning and letter titled "Re: Mining Proposal for General Lease Development at Nickol Bay Quarry (MP 5868)" dated 20 December 2007 signed by Georgia Manning, and retained on Department of Mines and Petroleum File No. E0191/200501. <p>Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.</p>	31/03/2009	
21	The lessee submitting to the Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: <ul style="list-style-type: none"> August. 	31/03/2009	

M47/26 – conditions current at 18/03/2008

	Start Date	End Date
Conditions		
1 Survey	09/11/1984	
2 All topsoil being removed ahead of mining operations and stockpiled for replacement in accordance with the directions of the Mining Engineer - District Inspector of Mines.	09/11/1984	
3 Compliance with the provisions of the Aboriginal Heritage Act 1972 to ensure that no action is taken which is likely to interfere with or damage any sacred site.	09/11/1984	
4 Mining on any road or road reserve being confined to below a depth of 15 metres from the natural surface.	09/11/1984	
5 Unless otherwise directed by the Regional Mining Engineer:	09/11/1984	
<ul style="list-style-type: none"> • Topsoil being removed and stockpiled for replacement prior to the excavation of costeans, trenches or pits. • All excavations being progressively refilled as sampling proceeds; and the topsoil returned as soon as possible. • All excavation and surface disturbances made by the tenement holder being refilled and the ground rehabilitated to the satisfaction of the Regional Mining Engineer/District Mining Engineer. 		
6 No developmental or productive mining being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.	09/11/1984	11/08/2005
No developmental or productive mining being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.	12/08/2005	
7 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled:	30/05/1992	
<ul style="list-style-type: none"> • "Mining Development Proposal, Nickol Bay Environmental Management Plan 47/26 and 47/255" dated August 1991; • Correspondence dated 30 March 1992 and survey plan titled "Nickol Bay Quarry ML 47/26 and Topo Survey ML 47/255" Limit of Extraction, Revised 30 April 1992. 		

and retained on Mines Department File No 566/90.

Where a difference exists between the above documents

and the following conditions, then the following conditions shall prevail.

- | | | | |
|----|--|------------|------------|
| 8 | The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. | 30/05/1992 | |
| 9 | All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses. | 30/05/1992 | |
| 10 | At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer. | 30/05/1992 | |
| 11 | All rubbish and scrap being progressively disposed of in a suitable manner. | 30/05/1992 | |
| 12 | At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer. | 30/05/1992 | |
| 13 | Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document not commencing until a plan of operations and a programme to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained. | 30/05/1992 | |
| 14 | The lessee providing a Bank Guaranteed Unconditional Performance Bond in favour of the Minister for Mines in the sum of \$50,000 for due compliance with the conditions of the lease. | 30/05/1992 | |
| 15 | The lessee submitting to the State Mining Engineer in September of each year, a brief annual report outlining the operations and rehabilitation undertaken in the previous 12 months and the proposed operations and rehabilitation programmes for the next 12 months. | 09/11/1984 | 22/08/1996 |
| | The lessee submitting to the State Mining Engineer in August of each year, a brief annual report outlining the operations and rehabilitation undertaken in the previous 12 months and the proposed operations and rehabilitation programmes for the next 12 months. | 23/08/1996 | |
| 16 | No further ground disturbance is to occur in the area of land from the crest of the hill, South to the limit of extraction, and this area will be maintained from the safety bund and rehabilitation/landscaping. The ridge of the hill running along Northing 3860m between Easting 2670m and 2790m on the above survey plan must be left intact as a visual barrier. | 09/11/1984 | |

**Consent to Mine on Industrial Development Reserve No.
49120 granted on 4 March 2008.**

M47/255 – conditions current at 18/03/2008

	Start Date	End Date
Endorsements		
1 The lessee's attention is drawn to the provisions of the Aboriginal Heritage Act, 1972 and any Regulations thereunder.	27/06/2006	
2 This mining lease authorises the mining of the land for all minerals as defined in Section 8 of the Mining Act 1978 with the exception of: <ul style="list-style-type: none"> • Uranium Ore; • Iron Ore, unless specifically authorised under Section 111 of the Act. 	27/06/2006	
3 The lessee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	27/06/2006	
Conditions		
1 Survey.	18/05/1992	
2 Compliance with the provisions of the Aboriginal Heritage Act, 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.	18/05/1992	
3 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	18/05/1992	
4 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the District Mining Engineer.	18/05/1992	11/08/2005
All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	12/08/2005	
5 All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.	18/05/1992	
6 Unless the written approval of the District Mining Engineer, Department of Mines, is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised	18/05/1992	11/08/2005

equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

12/08/2005

- 7 ~~No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.~~

18/05/1992

11/08/2005

No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.

12/08/2005

- 8 ~~Cancellation without compensation upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.~~

18/05/1992

20/11/1995

- 9 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled:

18/05/1992

- " Mining Development Proposal, Nickol Bay Environment Management Plan 47/26 and 47/255" dated August 1991;
- Correspondence dated 30 March 1992 and survey plan titled "Nickol Bay Quarry ML 47/26 and Topo Survey ML 47/255, Limit of Extraction, Revised 30 April 1992

and retained on Mines Department File No. 566/90

Where a difference exists between the above documents and the following conditions, then the following conditions shall prevail.

- 10 The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.

18/05/1992

11	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	18/05/1992	
12	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	18/05/1992	26/06/2006
	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environmental Division.	27/06/2006	
13	All rubbish and scrap being progressively disposed of in a suitable manner.	18/05/1992	
14	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	18/05/1992	26/06/2006
	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environmental Division	27/06/2006	
15	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document not commencing until a plan of operations and a program to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained.	18/05/1992	26/06/2006
	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document not commencing until a plan of operations and a program to safeguard the environment are submitted to the Director, Environmental Division for his assessment and until his written approval to proceed has been obtained.	27/06/2006	
16	The lessee providing a Bank Guaranteed Unconditional Performance Bond in favour of the Minister for Mines in the sum of \$7,500 for due compliance with the environmental conditions on the lease.	18/05/1992	
17	The lessee submitting to the State Mining Engineer in September of each year, a brief annual report outlining the operations and rehabilitation work undertaken in the previous 12 months and the proposed operations and rehabilitation programs for the next 12 months.	18/05/1992	22/08/1996
	The lessee submitting to the State Mining Engineer in August of each year, a brief annual report outlining the operations and rehabilitation work undertaken in the	23/08/1996	26/06/2006

~~previous 12 months and the proposed operations and rehabilitation programs for the next 12 months.~~

The lessee submitting to the Director, Environment Division, 27/06/2006
a brief annual report outlining the project operations,
minesite environmental management and rehabilitation work
undertaken in the previous 12 months and the proposed
operations, environmental management plans and
rehabilitation programmes for the next 12 months. This
report to be submitted each year in:

- August

18 No further ground disturbance occurring in the area of land 18/05/1992
from the crest of the hill, south to the limit of extraction, and
this area being maintained for the safety bund and
rehabilitation/landscaping. The ridge of the hill running along
Northing 3860m between Easting 2670m and 2790m on the
above survey plan being left intact as a visual barrier.

19 No mining (quarrying) activities are to be undertaken in the 27/06/2006
areas which have been deemed to have high environmental
significance as shown in figure 1 in the letter titled "Re:
Western Extension to Nickol Bay Quarry - M47/333" dated
15 February 2005 and signed by Sharron Sylvester and
retained on Department of Industry and Resources File No.
2501-99

20 Any proposal for exploration activities in the areas which are 27/06/2006
deemed to have high environmental significance as show in
figure 1 in the letter titled "Re: Western Extension to Nickol
Bay Quarry - M47/333" dated 15 February 2005, signed by
Sharron Sylvester and retained on Department of Industry
and Resources File No. 2501-99, needs to be referred to the
Environmental Protection Authority under Section 38 of the
Environmental Protection Act 1986.

21 At the completion of operations, all buildings and structures 27/06/2006
being removed from site or demolished and buried to the
satisfaction of the Director, Environment Division, DoIR.

**Consent to Mine on Industrial Development Reserve No.
49120 given on the 4 March, 2008.**

Conditions – M47/306 as at 12/11/2008

	Start Date	End Date
Endorsements		
1 The lessee attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	27/06/2006	
2 This mining lease authorises the mining of the land for all minerals as defined in Section 8 of the Mining Act 1978 with the exception of: <ul style="list-style-type: none"> • Uranium Ore; • Iron Ore, unless specifically authorised under Section 111 of the Act. 	27/06/2006	
3 The lessee/licensee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	27/06/2006	
Conditions		
1 Survey	11/05/1993	
2 Compliance with the provisions of the Aboriginal Heritage Act 1972 to ensure that no action is taken which is likely to interfere with or damage any Aboriginal Site.	11/05/1993	
3 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	11/05/1993	
4 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the District Mining Engineer.	11/05/1993	11/08/2005
All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	12/08/2005	
5 All waste material, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	11/05/1993	
6 Unless the written approval of the District Mining Engineer, Department of Mines, is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised	11/05/1993	11/08/2005

	equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.		
	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	12/08/2005	
7	No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.	11/05/1993	11/08/2005
	No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.	12/08/2005	
8	No mining on Water Reserve 37967 and Pistol Range Reserve 40174 (De Witt Locations 272 and 231) without the prior written consent of the Minister for Mines.	11/05/1993	
9	Cancellation of the lease without compensation, upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.	11/05/1993	20/11/1995
10	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled: <ul style="list-style-type: none"> • "Statement No 000440"; • "Statement That a Proposal May be Implemented (pursuant to The Provisions of the Environmental Protection Act 1986); • Hand Rock Quarry - ML47/306, 309, 331 & 353 Burrup Peninsula (902)" Published on 17 February 1997; And all retained on Department of Minerals and Energy File No 2161/96 Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	15/05/2000	
11	The development and operation of the project being carried	15/05/2000	

	out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform		
12	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	15/05/2000	
13	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	15/05/2000	
14	All rubbish and scrap is to be progressively disposed of in a suitable manner.	15/05/2000	
15	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	15/05/2000	26/06/2006
	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environmental Division.	27/06/2006	
16	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained.	15/05/2000	11/08/2005
	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Director, Environment, DoIR for his assessment and until his written approval to proceed has been obtained.	12/08/2005	
17	The lessee arranging lodgement of an Unconditional Performance Bond executed by a Bank or other approved financial institution in favour of the Minister for Mines in the sum of \$11,000 for due compliance with the environmental conditions of the lease.	15/05/2000	
18	The lessee submitting to the State Mining Engineer in August of each year, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months.	15/05/2000	26/06/2006
	The lessee submitting to the Director, Environment Division,	27/06/2006	

a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in:

- August

- 19 No ground disturbance occurring in the area of land from the crest of the hill, south to the limit of extraction, and this area being maintained for safety Bund and rehabilitation/landscaping. 15/05/2000
- 20 No mining (quarrying) activities are to be undertaken in the areas which have been deemed to have high environmental significance as shown in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005 and signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99 27/06/2006
- 21 Any proposal for exploration activities in the areas which are deemed to have high environmental significance as show in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005, signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99, needs to be referred to the Environmental Protection Authority under Section 38 of the Environmental Protection Act 1986. 27/06/2006

Consent to Mine on Industrial Development Reserve No. 49120 given on the 4 March, 2008.

Conditions – M47/309 as at 18/03/2008

	Start Date	End Date
Endorsements		
1 The lessee attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	27/06/2006	
2 This mining lease authorises the mining of the land for all minerals as defined in Section 8 of the Mining Act 1978 with the exception of: <ul style="list-style-type: none"> • Uranium Ore; • Iron Ore, unless specifically authorised under Section 111 of the Act. 	27/06/2006	
3 The lessee/licensee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	27/06/2006	
Conditions		
1 Survey	01/07/1993	
2 Compliance with the provisions of the Aboriginal Heritage Act 1972 to ensure that no action is taken which is likely to interfere with or damage any Aboriginal Site.	01/07/1993	
3 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	01/07/1993	
4 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the District Mining Engineer.	01/07/1993	11/08/2005
All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	12/08/2005	
5 All waste material, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	01/07/1993	
6 Unless the written approval of the District Mining Engineer, Department of Mines, is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised	01/07/1993	11/08/2005

equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

7 ~~No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.~~ 01/07/1993 11/08/2005

No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.

8 No mining on Pistol Range Reserve 40174 Location 272, Repeater Station Site Reserve 42039, Water Reserve 37967 Location 154 and Proposed Katrin Hills Telecommunications Reserve without the prior written consent of the Minister for Mines. 01/07/1993

Consent to Mine on Temporary Reserve 5461H given subject to:

9 ~~Cancellation of the lease without compensation, upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.~~ 01/07/1993 20/11/1995

10 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled:

- "Statement No 000440";
- "Statement That a Proposal May be Implemented (pursuant to The Provisions of the Environmental Protection Act 1986);
- Hand Rock Quarry - ML47/306, 309, 331 & 353 Burrup Peninsula (902)" Published on 17 February 1997;

And all retained on Department of Minerals and Energy File No 2161/96

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

- | | | | |
|----|--|------------|------------|
| 11 | The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform | 15/05/2000 | |
| 12 | All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses. | 15/05/2000 | |
| 13 | At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer. | 15/05/2000 | 26/06/2006 |
| | At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environmental Division. | 27/06/2006 | |
| 14 | All rubbish and scrap is to be progressively disposed of in a suitable manner. | 15/05/2000 | |
| 15 | At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer. | 15/05/2000 | 26/06/2006 |
| | At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environmental Division. | 27/06/2006 | |
| 16 | Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained. | 15/05/2000 | 11/08/2005 |
| | Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Director, Environment, DoIR for his assessment and until his written approval to proceed has been obtained. | 12/08/2005 | |
| 17 | The lessee submitting to the State Mining Engineer in August of each year, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management | 15/05/2000 | 26/06/2006 |

~~plans and rehabilitation programmes for the next 12 months.~~

The lessee submitting to the Director, Environment Division, 27/06/2006
a brief annual report outlining the project operations,
minesite environmental management and rehabilitation work
undertaken in the previous 12 months and the proposed
operations, environmental management plans and
rehabilitation programmes for the next 12 months. This
report to be submitted each year in:

- August

- 18 No ground disturbance occurring in the area of land from the 15/05/2000
crest of the hill, south to the limit of extraction, and this area
being maintained for safety bund and
rehabilitation/landscaping.
- 19 No mining (quarrying) activities are to be undertaken in the 27/06/2006
areas which have been deemed to have high environmental
significance as shown in figure 1 in the letter titled "Re:
Western Extension to Nickol Bay Quarry - M47/333" dated
15 February 2005 and signed by Sharron Sylvester and
retained on Department of Industry and Resources File No.
2501-99
- 20 Any proposal for exploration activities in the areas which are
deemed to have high environmental significance as shown
in figure 1 in the letter titled "Re: Western Extension to
Nickol Bay Quarry - M47/333" dated 15 February 2005,
signed by Sharron Sylvester and retained on Department of
Industry and Resources File No. 2501-99, needs to be
referred to the Environmental Protection Authority under
Section 38 of the Environmental Protection Act 1986.

Conditions – M47/331 as at 23/07/2007

	Start Date	End Date
Endorsements		
1 The land the subject of this lease does not include land the subject of Pistol Range Reserve 40174.	14/10/1993	
2 The lessee attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	27/06/2006	
3 This mining lease authorises the mining of the land for all minerals as defined in Section 8 of the Mining Act 1978 with the exception of: <ul style="list-style-type: none"> • Uranium Ore; • Iron Ore, unless specifically authorised under Section 111 of the Act. 	27/06/2006	
4 The lessee/licensee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	27/06/2006	
Conditions		
1 Survey	14/10/1993	
2 Compliance with the provisions of the Aboriginal Heritage Act 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.	14/10/1993	
3 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	14/10/1993	
4 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the District Mining Engineer.	14/10/1993	11/08/2005
All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	12/08/2005	
5 All waste material, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	14/10/1993	
6 Unless the written approval of the District Mining Engineer,	14/10/1993	11/08/2005

Department of Mines, is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

Unless the written approval of the Environmental Officer, DolR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

12/08/2005

- 7 ~~No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.~~

14/10/1993

11/08/2005

No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DolR for assessment; and until his written approval has been obtained.

12/08/2005

Consent to mine on Temporary Reserve 5461H given subject to :

- 8 ~~Cancellation of the Lease without compensation, upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.~~

14/10/1993

20/11/1995

- 9 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled:

15/05/2000

- "Statement No 000440";
- "Statement that a Proposal may be Implemented (pursuant to The Provisions of the Environmental Protection Act 1986); and
- Hand Rock Quarry - ML47/306, 309, 331 & 353 Burrup Peninsula (902)" Published on 17 February 1997;

and all retained on Department of Minerals and Energy File No 2161/96

Where a difference exists between the above documents and the following conditions, then the following conditions shall prevail.

10	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.	15/05/2000	
11	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	15/05/2000	
12	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	15/05/2000	26/06/2006
	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environmental Division.	27/06/2006	
13	All rubbish and scrap being progressively disposed of in a suitable manner.	15/05/2000	
14	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	15/05/2000	26/06/2006
	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environmental Division.	27/06/2006	
15	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained.	15/05/2000	11/08/2005
	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Director, Environment, DoIR for his assessment and until his written approval to proceed has been obtained.	12/08/2005	
16	The lessee submitting to the State Mining Engineer in August of each year, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months.	15/05/2000	26/06/2006
	The lessee submitting to the Director, Environment Division, a brief annual report outlining the project operations,	27/06/2006	

minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in:

- August

- | | | |
|----|--|------------|
| 17 | No ground disturbance occurring in the area of land from the crest of the hill, south to the limit of extraction, and this area being maintained for safety bund and rehabilitation/landscaping. | 15/05/2000 |
| 18 | No mining (quarrying) activities are to be undertaken in the areas which have been deemed to have high environmental significance as shown in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005 and signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99 | 27/06/2006 |
| 19 | Any proposal for exploration activities in the areas which are deemed to have high environmental significance as show in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005, signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99, needs to be referred to the Environmental Protection Authority under Section 38 of the Environmental Protection Act 1986. | 27/06/2006 |

Conditions – M47/333 as at 18/03/2008

	Start Date	End Date
Endorsements		
1 The lessee attention is drawn to the provisions of the Aboriginal Heritage Act 1972 and any Regulations thereunder.	27/06/2006	
2 This mining lease authorises the mining of the land for all minerals as defined in Section 8 of the Mining Act 1978 with the exception of: <ul style="list-style-type: none"> • Uranium Ore; • Iron Ore, unless specifically authorised under Section 111 of the Act. 	27/06/2006	
3 The lessee/licensee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	27/06/2006	
Conditions		
1 Survey	14/10/1993	
2 Compliance with the provisions of the Aboriginal Heritage Act 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.	14/10/1993	
3 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	14/10/1993	
4 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the District Mining Engineer.	14/10/1993	11/08/2005
All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	12/08/2005	
5 All waste material, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	14/10/1993	
6 Unless the written approval of the District Mining Engineer is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface	14/10/1993	11/08/2005

~~clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.~~

Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface clearing or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

- 7 ~~No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.~~

No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.

Consent to Mine on Temporary Reserve 5461H given subject to:

- 8 ~~Cancellation of the Lease without compensation, upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.~~

- 9 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled:

- "Public Environmental Review, Western Extension to Nickol Bay Quarry (Mining Lease 47/333) Burrup Peninsula, Dampier" (NOI 4034) dated July 2002 and retained on Department of Industry and Resources File No. 4139000

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

- 10 No mining (quarrying) activities are to be undertaken in the areas which have been deemed to have high environmental significance as shown in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005 and signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99

- 11 Any proposal for exploration activities in the areas which are deemed to have high environmental significance as show in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005, signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99, needs to be referred to the Environmental Protection Authority under Section 38 of the Environmental Protection Act 1986. 27/06/2006
- 12 The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. 27/06/2006
- 13 All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses. 27/06/2006
- 14 At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environment Division, DoIR. 27/06/2006
- 15 All rubbish and scrap is to be progressively disposed of in a suitable manner. 27/06/2006
- 16 At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division, DoIR. 27/06/2006
- 17 Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Director, Environment, DoIR for his assessment and until his written approval to proceed has been obtained. 27/06/2006
- 18 The lessee submitting to the Director, Environment Division, DoIR, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: 27/06/2006
- August.

Conditions – M47/353 as at 23/07/2007

	Start Date	End Date
Endorsements		
1 The lessee's attention is drawn to the provisions of the Aboriginal Heritage Act, 1972	23/08/1995	
2 This mining lease authorises the mining of the land for all minerals as defined in Section 8 of the Mining Act 1978 with the exception of: <ul style="list-style-type: none"> • Uranium Ore: • Iron Ore, unless specifically authorised under Section 111 of the Act. 	27/06/2006	
3 The lessee/licensee's attention is drawn to the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004, which provides for the protection of all native vegetation from damage unless prior permission is obtained.	27/06/2006	
Conditions		
1 Survey.	23/08/1995	
2 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	23/08/1995	
3 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the District Mining Engineer.	23/08/1995	11/08/2005
All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	12/08/2005	
4 All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.	23/08/1995	
5 Unless the written approval of the District Mining Engineer, Department of Mines, is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion	23/08/1995	11/08/2005

of operations.

Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

- 6 ~~No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.~~

No developmental or productive mining or construction activity being commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment; and until his written approval has been obtained.

Consent to Mine on Temporary Reserve 5461H given subject to:-

- 7 ~~Cancellation of the Lease without compensation, upon notice in writing from the Minister for Mines that the ground within this tenement or any portion thereof is required for public purposes or industrial development.~~

- 8 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled:

- "Statement No 000440";
- "statement That a Proposal May Be Implemented (pursuant to The Provisions of the Environmental Protection Act 1986)" ; and
- Hand Rock Quarry - ML47/306, 309, 331, and 353 Burrup Peninsula (902)" Published on 17 February 1997;

And all retained on Department of Minerals and Energy File No. 2161/96.

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail..

- 9 The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.

10	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	15/05/2000	
11	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	15/05/2000	26/06/2006
	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environmental Division.	27/06/2006	
12	All rubbish and scrap being progressively disposed of in a suitable manner.	15/05/2000	
13	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	15/05/2000	26/06/2006
	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division.	27/06/2006	
14	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a program to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained.	15/05/2000	26/06/2006
	Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a program to safeguard the environment are submitted to the Director, Environment Division DoIR for his assessment and until his written approval to proceed has been obtained.	27/06/2006	
15	The lessee submitting to the State Mining Engineer in August of each year, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programs for the next 12 months.	15/05/2000	26/06/2006
	The lessee submitting to the Director, Environment Division, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This	27/06/2006	

report to be submitted each year in:

- August

- | | | |
|----|--|------------|
| 16 | No ground disturbance occurring in the area of land from the crest of the hill, south to the limit of extraction, and this area being maintained for safety bund and rehabilitation/landscaping. | 15/05/2000 |
| 17 | No mining (quarrying) activities are to be undertaken in the areas which have been deemed to have high environmental significance as shown in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005 and signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99 | 27/06/2006 |
| 18 | Any proposal for exploration activities in the areas which are deemed to have high environmental significance as show in figure 1 in the letter titled "Re: Western Extension to Nickol Bay Quarry - M47/333" dated 15 February 2005, signed by Sharron Sylvester and retained on Department of Industry and Resources File No. 2501-99, needs to be referred to the Environmental Protection Authority under Section 38 of the Environmental Protection Act 1986. | 27/06/2006 |
| 19 | At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environmental Division. | 27/06/2006 |

Appendix 3
Audit Program



LOW IMPACT MINING - ANNUAL ENVIRONMENTAL REPORT

- Please answer all relevant questions and forward the completed Annual Environmental Report form with the site plan and any other relevant attachments to the relevant Environmental Officer (see below).
Additional information may be attached if space is insufficient.
This form is available from the Department's website - www.doir.wa.gov.au. Do not use this form for operations exceeding 50,000 tonnes of material mined in total per year, instead use: "Guidelines for the preparation of an Annual Environmental Report."

Project name: _____

Location: _____

Tenements: _____ Reporting period: _____

Tenement holder(s): _____

Operator (if different from above): Name(s): _____

Address: _____

Phone: _____ Fax: _____ Email: _____

Type of Mining Operations (Please circle all applicable)

Vat leach / heap leach / CIP-CIL / dryblowing / alluvial gold mining / ornamental stone / gypsum / lime / sand / gravel / hard rock / Other _____

When did mining occur in the last 12 months: _____

Please describe any new mining / processing to occur in the coming 12 months: _____

Amount of material excavated or mined during the reporting period?

Ore: _____ tonnes Overburden _____ tonnes Total: _____ tonnes

Are you required to have a Native Vegetation Clearing Permit? Yes / No If yes, please give Permit No. _____

A Site Plan must be attached showing the tenement boundaries, roads and tracks, areas disturbed and rehabilitated (highlighting this year's activities). The location of infrastructure (camp, fixed machinery, tailings dams, sheds, workshops, laydown areas, etc) and major natural features (drainage lines, plains, hills, stands of vegetation, etc). TENGRAPH plans can be used as the basis for the Site Plan - use a small scale such as 1:5000.

DEPARTMENT CONTACT ADDRESSES

Table with 2 columns: PERTH INSPECTORATE and KALGOORLIE INSPECTORATE. Rows include department addresses, telephone/fax numbers, and lists of mineral fields.

PLEASE FILL OUT THE FOLLOWING WHERE RELEVANT:

1. Tailings Storage

Area of tailings dams: _____ ha No. of dams: _____ Height of storage(s): _____ m

Are water recovery systems in place? Yes / No Is water reclaimed? Yes / No

If yes, describe (ie: floating pump / central decant / external sump / other _____)

What are the average pH, salinity and cyanide levels of the:

Process water: _____ Reclaim water: _____

Are there any signs of seepage from the walls? Yes / No If yes please describe any impacts and corrective actions (include photographs):

Are you required to have a DoE Licence? Yes / No Is the DoE Licence current? Yes / No
(Please contact your Regional DoE office if unsure.)

2. Water Management

Describe your water sources: surface dam / groundwater bore / artesian / mains supply /other _____;
water quality: fresh / brackish / salty and water quantity used (kilolitres/year) for:

	Sources	Quality	Quantity (KL/y)
Process Water:			
Domestic Water:			

Are you required to have a Surface or Groundwater Licence? Yes / No

If yes, describe type and give number: _____

If no, then have you checked this with your regional DoE office? Yes / No

Which office: _____ When: _____

3. Pollution Control

Have there been any pipeline failures, spillages of environmental mishaps? Yes / No

If yes, please describe the incident(s) and the corrective actions taken: _____

Do you use any process chemicals (eg. cyanide) Yes / No If yes, please specify: _____

If you have saline dams, is the dam lined? Yes / No

Are fuel storages bunded? Yes / No Volume of fuel stored on site: _____ litres

Do you undertake any water monitoring? Yes / No

If yes, describe: _____

Water monitoring frequency: _____ Who does the analysis: _____

(Please attach a copy of any water monitoring and water quality analysis results.)

How is domestic and industrial waste managed? _____

4. Rehabilitation (Please attach labeled photographs)

Is topsoil stockpiled separately? Yes / No Has topsoil been used for rehabilitation? Yes / No

If not, explain why: _____

Are compacted ground and hardstands ripped or scarified as part of rehabilitation? Yes / No

Describe briefly how rehabilitation was carried out: _____

Were rehabilitation areas re-seeded? Yes / No Was seed from local native plant species used? Yes / No

Describe rehabilitation success or any problems and corrective actions (eg. erosion, weeds, grazing, etc).

(Please attach photographs): _____

Project Summary Table:

Please complete the table below for areas currently open and disturbed by mining activities and for areas that have been mined-out and rehabilitated, for each tenement. See below for explanatory notes.

TENEMENT ⇨	HECTARES DISTURBED & REHABILITATION ^α											
	Years previous ^β		Last 12 months ^β		Years previous		Last 12 months		Years previous		Last 12 months	
	Dist.	Rehab	Dist.	Rehab	Dist.	Rehab	Dist.	Rehab	Dist.	Rehab	Dist.	Rehab
Open Pit Mining												
Waste Dumps												
Surface Scraping												
Tails Dams												
Vat/Heap Leach												
Camp Area												
Plant Area												
Hardstand												
Laydown (scrap)												
Exploration												
Roads / tracks												
Other												
TOTALS												

*(Use the back of the page if you are required to report on more than 3 tenements).

- Checklist for Attachments:**
- Have you included a site plan?
 - Have you included water analysis / monitoring results, if applicable?
 - Have you included photographs (overview of site, recent mining, rehabilitation, etc.)?

Signed: _____ Date: _____

Name: _____ Position: _____

Explanatory Notes:

- ^α Rehabilitation – denotes areas that have been re-contoured, spread with topsoil and cleared vegetation, scarified, and seeded.
- ^β Years Previous – the cumulative disturbance (ha) prior to the current reporting period associated with your current NOI.
- ^γ Last 12 months – the disturbance created in the current reporting period relevant to this report.

Appendix 4
SHE Checklists



AUDIT TABLE

Proposal Implementation Monitoring Section

MINISTERIAL STATEMENT: 713

PROJECT: HARD ROCK QUARRY BURRUP PENINSULA

Note:

- Phases that apply in this table = **Pre-Construction, Construction, Operation, Decommissioning, Overall (several phases)**
- This audit table is a summary and timetable of conditions and commitments applying to this project. Refer to the Minister's Statement for full detail/precise wording of individual elements.
- Code prefixes: M = Minister's condition; P = Proponent's commitment; A = Audit specification; N = Procedure.
- Any elements with status "Audited by proponent only" are legally binding but are not required to be addressed specifically in compliance reports, if complied with.
- Acronyms list: Department of Conservation and Land Management - CALM; Chief Executive Officer as defined under *Environmental Protection Act 1986* - CEO; Department of Environment - DoE; Department of Indigenous Affairs - DIA; Department of Industry and Resources - DoIR; Environmental Protection Authority - EPA; Minister for the Environment - Min for Env.

Audit Code	Subject	Action	How	Evidence	Requirements of	On Advice from	Phase	When/Where	Status
713:M1.1	Implementation	The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions and procedures of this statement.		Compliance reports, performance reviews.	Min for Env	Overall	Overall		
713:M2.1	Proponent Commitments	The proponent shall implement the environmental management commitments documented in schedule 2 of this statement.		Compliance reports, performance reviews.	Min for Env	Overall	Overall		
713:M3.1	Proponent Nomination and Contact Details	The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the <i>Environmental Protection Act 1986</i> is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.			Min for Env	Overall	Overall		
713:M3.2	Proponent Nomination and Contact Details	If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.		Letter of request for transfer to Min for Env with a copy of this statement, endorsed by the proposed replacement proponent. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.	Min for Env	Overall	Overall		Completed Letter provided to DEC 29/05/09
713:M3.3	Proponent Nomination and Contact Details	The nominated proponent shall notify the Department of Environment of any change of contact name and address within 60 days of such change.		Written notification to CEO.	DoE	Overall	Overall		
713:M4.1	Commencement	The proponent shall substantially commence mining in the western pit extension within five years of the date of this statement or the approval for that extension granted in this statement shall lapse and be void.		Write to CEO to advise of substantial commencement of mining in the western pit extension.	Min for Env	Min for Env	Commence by 23 January 2011		
713:M4.2	Time Limit of Approval	The proponent shall make application for any extension of approval for the substantial commencement of the western pit extension beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 4-1.	Write to Min of Env to apply for extension of approval for the substantial commencement of the western pit extension, prior to expiration of the five-year period referred to in condition 4-1. The application shall demonstrate that: 1. the environmental factors of the proposal have not changed significantly; 2. new, significant, environmental issues have not arisen; and 3. all relevant government authorities have been consulted.	Copy of written application to Min for Env.	Min for Env	Pre-construction	Prior to 23 January 2011		



AUDIT TABLE

Proposal Implementation Monitoring Section
MINISTERIAL STATEMENT: 713
PROJECT: HARD ROCK QUARRY BURRUP PENINSULA

Audit Code	Subject	Action	How	Evidence	Requirements of	On Advice from	Phase	When/Where	Status
713:M5.1.1	Compliance Audit and Performance Review	The proponent shall prepare an audit program.	The audit program shall address: 1. the status of implementation of the proposal as defined in schedule 1 of this statement; 2. evidence of compliance with the conditions and commitments; and 3. the performance of the environmental management plans and programs.	Audit Program and evidence of its approval by DoE.	DoE		Overall		
713:M5.1.2	Compliance Audit and Performance Review	The proponent shall submit compliance reports to the Department of Environment.	The compliance reports shall address: 1. the status of implementation of the proposal as defined in schedule 1 of this statement; 2. evidence of compliance with the conditions and commitments; and 3. the performance of the environmental management plans and programs.	Annual Compliance Report	DoE		Overall	Annually	
713:M5.2	Compliance Audit and Performance Review	The proponent shall submit a performance review report every five years after the publication of this statement.	The performance review report shall address: 1. the major environmental issues associated with the project; the environmental objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets; 2. the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable; 3. significant improvements gained in environmental management, including the use of external peer reviews; 4. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and 5. the proposed environmental objectives over the next five years, including improvements in technology and management processes.	Performance Review Report	Min for Env EPA		Overall	By 31 st December every 5 years from the date of issue of the Statement.	



AUDIT TABLE

Proposal Implementation Monitoring Section MINISTERIAL STATEMENT: 713

PROJECT: HARD ROCK QUARRY BURRUP PENINSULA

Audit Code	Subject	Action	How	Evidence	Requirements of	On Advice from	Phase	When/Where	Status
713:M6.1	Environmental Management Plan	Prior to commencement of operations in the western extension, the proponent shall update the Environmental Management Plan for the quarry, to include operations in the western extension.	This Plan shall address the following: 1. Management of declared rare and priority flora and vegetation communities; 2. Management of threatened and priority fauna; 3. Management of operations to reduce visual impact; 4. Aboriginal heritage management; 5. Noise management; 6. Dust management; 7. Control of weeds and introduced animal species; 8. Management of fuels and oils; 9. Surface water management; and 10. Conceptual closure plan.	Environmental Management Plan and evidence of its acceptance by Min for Env.	Min for Env	EPA, CALM, DoIR and DIA		Prior to commencement of operations in the western extension.	In Process
713:M6.2	Environmental Management Plan	The proponent shall implement the Environmental Management Plan required by condition 6-1.		Compliance reports, performance reviews.	Min for Env		Overall	Ongoing	
713:M6.3	Environmental Management Plan	The proponent shall make the Environmental Management Plan required by condition 6-1 publicly available.	In accordance with 'Proposal Implementation Monitoring Section – Fact Sheet 1 – Making Documents Publicly Available – May 2009 – Version 1' or its subsequent revisions.	Compliance reports.	Min for Env		Overall	Within 2 weeks of receiving approval of the Plan from DEC.	
713:M7.1	Management of areas withdrawn from quarrying plans	The proponent shall prepare a Management Plan to the requirements of the Min for Env on advice of the EPA to prevent quarry-related impacts on vegetation in the areas withdrawn from quarrying plans as shown in Figure 3 of Schedule 1.		Management Plan and evidence of its acceptance by Min for Env.	Min for Env	EPA		Prior to 23 July 2006.	Completed
713:M7.2	Management of areas withdrawn from quarrying plans	The proponent shall implement the Management Plan required by condition 7-1.		Compliance reports, performance reviews.	Min for Env		Overall	Ongoing	
713:M7.3	Management of areas withdrawn from quarrying plans	The proponent shall make the Management Plan required by condition 7-1 publicly available.	In accordance with 'Proposal Implementation Monitoring Section – Fact Sheet 1 – Making Documents Publicly Available – May 2009 – Version 1' or its subsequent revisions.	Compliance reports.	DoE		Overall	Within 2 weeks of receiving approval of the Plan from DEC.	
713:M8.1	Progressive Rehabilitation Programme	The proponent shall prepare a Progressive Rehabilitation Programme for the quarry and associated infrastructure located within Mining Leases M47/26, M47/255, M47/306, M47/309, M47/331, M47/333 and M47/353 and General Purpose leases G47/23 & 47/42.	The program shall incorporate: 1. proposed final land use, rehabilitation objectives and completion criteria; 2. method and management of rehabilitation of mined pit faces, pit floors and other areas in order to protect visual amenity; and 3. the sequence and indicative timetable for the rehabilitation of quarry pit floors, pit faces and other disturbed areas within the leases, and relocation of rock stock piles, waste dumps and other quarry infrastructure into disused quarry pits.	Progressive Rehabilitation Programme and evidence of its approval by Min for Env.	Min for Env	EPA	Pre-construction	Prior to 23 January 2009 and prior to the commencement of mining within Mining Lease M47/333, whichever is sooner.	
713:M8.2.1	Progressive Rehabilitation Programme	In the development of the Progressive Rehabilitation Programme required by condition 8-1, the proponent shall prepare a consultation plan to identify important stakeholders and the methods of consultation to be employed in the development of the Programme.		Consultation Plan and evidence of its approval by Min for Env.	Min for Env	EPA	Pre-construction	Prior to development of the Progressive Rehabilitation Programme.	



AUDIT TABLE

Proposal Implementation Monitoring Section MINISTERIAL STATEMENT: 713

PROJECT: HARD ROCK QUARRY BURRUP PENINSULA

Audit Code	Subject	Action	How	Evidence	Requirements of	On Advice from	Phase	When/Where	Status
713:M8.2.2	Progressive Rehabilitation Programme	In the development of the Progressive Rehabilitation Programme required by condition 8-1, the proponent shall implement a consultation plan.		Compliance reports.	Min for Env	EPA	Pre-construction	Prior to development of the Progressive Rehabilitation Programme.	
713:M8.3	Progressive Rehabilitation Programme	The proponent shall make copies of the Progressive Rehabilitation Programme required by condition 8-1 publicly available upon request by any person.	In accordance with 'Proposal Implementation Monitoring Section – Fact Sheet 1 – Making Documents Publicly Available – May 2009 – Version 1' or its subsequent revisions.	Compliance reports.	DoE		Overall	Within 2 weeks of receiving approval of the Programme from DEC	
713:M8.4	Progressive Rehabilitation Programme	The proponent shall implement the Progressive Rehabilitation Programme required by condition 8-1.		Compliance reports, performance reviews.	Min for Env		Overall	Ongoing	
713:M8.5	Progressive Rehabilitation Programme	The proponent shall review the Progressive Rehabilitation Programme required by condition 8-1 at intervals not exceeding five years.		Compliance reports.	Min for Env	EPA	Overall	At least every five years.	
713:M9.1	Decommissioning	The proponent shall carry out the satisfactory decommissioning of the quarry, removal of the plant and installations and rehabilitation of the site and its environs.		Compliance reports, performance reviews.	Min for Env			At closure of the Quarry	
713:M9.2	Decommissioning	At least six months prior to decommissioning, and within six months following any four-year period of stoppage of quarrying activity, the proponent shall prepare a Final Decommissioning and Rehabilitation Plan to achieve the objectives of conditions 8-1 and 9-1.		Final Decommissioning and Rehabilitation Plan and evidence of its acceptance by Min for Env.	Min for Env	EPA		At least six months prior to decommissioning, and within six months following any four-year period of stoppage of quarrying activity.	
713:M9.3	Decommissioning	The proponent shall implement the Final Decommissioning and Rehabilitation Plan required by condition 9-2.		Compliance reports, performance reviews.	Min for Env			At closure of the Quarry	
713:P1	Future expansion	Withdraw areas shown in figure 3 of schedule 1 from potential future quarrying plans.	Refer to Condition 7-1 and Procedure 1.		Min for Env				Completed
713:P2	Visual Amenity	Rehabilitate the upper bench of the south-facing quarry slopes which are visible from the plan.	By: 1. reducing the finished visible faces to a maximum 1:1 slope; 2. covering the reduced slopes with reddish brown coloured rocks and topsoil; 3. encouraging establishment of vegetation (mainly <i>Triodia</i> (spinifex) species); 4. seeding topsoiled areas with local seed if recolonisation is not progressing adequately within 18 months; 5. meeting with the Department of Conservation and Land Management annually for five years to assess rehabilitation progress and options.	Compliance reports, performance reviews.	Min for Env	CALM	Overall	During operation of the quarry.	
713:P3	Visual Amenity	Construct the southern part of the quarry safety bund to heights of up to 2.5 metres.		Compliance reports, performance reviews.	Min for Env		Overall	During operation of the quarry	
713:P4	Visual Amenity	Construct the visible part of the quarry safety bund with reddish brown coloured rocks and topsoil.		Compliance reports, performance reviews.	Min for Env		Overall	During operation of the quarry	
713:P5	Visual Amenity	Review the feasibility of relocating existing plant and stockpiles to within the quarry pit, and re-locate plant/stockpiles if practicable.		Compliance reports, performance reviews.	Min for Env		Overall	Annually	



AUDIT TABLE

Proposal Implementation Monitoring Section
MINISTERIAL STATEMENT: 713
PROJECT: HARD ROCK QUARRY BURRUP PENINSULA

Audit Code	Subject	Action	How	Evidence	Requirements of	On Advice from	Phase	When/Where	Status
713:P6	Rehabilitation and Decommissioning	Develop a detailed Rehabilitation and Decommissioning Plan. (See Conditions 8 and 9).	See Conditions 8 and 9.	Rehabilitation and Decommissioning Plan and evidence of its approval by Min for Env	Min for Env	EPA		Within 3 years following approval for the western extension, or prior to commencement of the western extension, whichever is the sooner.	
713:P7	Rehabilitation and Decommissioning	Implement the Rehabilitation and Decommissioning Plan referred to in commitment 6. (See Conditions 8 and 9)	See Conditions 8 and 9.	Compliance Reports	Min for Env		Overall	During and post-operation	
713:P8	Clearing of Vegetation	Restrict clearing of vegetation to a practical minimum.		Compliance reports, performance reviews.	Min for Env		Overall	During operation of the quarry	

Appendix 5

Compliance Planner



Annual Environmental Compliance and Audit Planner 2010

Site: Nickol Bay Quarry

Condition/Reference Number	REQUIRED ACTION	RESPONSIBILITY	Frequency	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	COMMENT
				Plan Done	Plan Done	Plan Done	Plan Done	Plan Done	Plan Done	Plan Done	Plan Done	Plan Done	Plan Done	Plan Done		
Permit Name: DEC L4741/1982/11																
	Renew crushing and screening licence annual fee	AP&D	Annual													Licence expires 30/09/2013
G2	Submit annual audit compliance report by 30 June each year	Env. Coordinator	Annual													
	DEC Licence L4741/1982/11 Compliance Audit	AP&D	Annual													
Permit Name: 2178/1																
	Submit Clearing Permit Report	AP&D/ Env. Coordinator	Annual													Permit expires 26/4/2011
NAC Annual Environmental Review																
	Review of compliance to the EMP	AP&D/ Env. Coordinator	Annual													
	Review draft Annual Environmental Report (DMP) with NAC	AP&D/ Env. Coordinator	Annual													
Annual Environmental Report - DMP																
	Submit Annual Environmental Report	Env. Coordinator	Annual													
Ministerial Statement 713																
	Annual Compliance Audit against MS713 Audit Programme	AP&D	Annual													Internal Holcim Audit
	Submit Annual Progress and Compliance Report	Env. Coordinator	Annual													Refer to MS 713 Condition 5-1
National Pollution Inventory Reporting																
	Submit NPI Report	Env. Coordinator	Annual													Due 30 September each year
EMP - General																
	Site Management Review	Quarry Manager	Annual													
	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Flora and Vegetation Management Plan																
5.	Site Management Review	Quarry Manager	Annual													
5.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Fauna Management Plan																
6.	Site Management Review	Quarry Manager	Annual													
6.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Conservation Area Preliminary Management Plan																
7.	Site Management Review	Quarry Manager	Annual													
7.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Visual Impact Management Plan																
8.	Site Management Review	Quarry Manager	Annual													
8.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Aboriginal Heritage Management Plan																
9.	Site Management Review	Quarry Manager	Annual													
9.	Review Cultural Heritage Management Plan with NAC Board	AP&D	Annual													
9.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Noise Management Plan																
10.	Site Management Review	Quarry Manager	Annual													
10.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Dust Management Plan																
11.	Site Management Review	Quarry Manager	Annual													
11.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Weeds and Feral Animals Management Plan																
12.	Site Management Review	Quarry Manager	Annual													
12.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Waste Management Plan																
13.	Site Management Review	Quarry Manager	Annual													
13.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Hydrocarbons Management Plan																
14.	Site Management Review	Quarry Manager	Annual													
14.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Surface Water Management Plan																
15.	Site Management Review	Quarry Manager	Annual													
15.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
EMP - Preliminary Rehabilitation Management Plan																
16.	Site Management Review	Quarry Manager	Annual													
16.	Annual Compliance Audit	AP&D	Annual													Internal Holcim Audit
NBQ Environmental Checklist																
		Quarry Manager	Monthly													
General Purpose Lease G47/23																
	Mining Proposal & Tenement Conditions Compliance Audit	AP&D	Annual													
	Annual lease rent	AP&D	Annual													Lease expires 2013
General Purpose Lease G47/42																
	Mining Proposal & Tenement Conditions Compliance Audit	AP&D	Annual													
	Annual lease rent	AP&D	Annual													Lease expires 2014
General Purpose Lease G47/47																

Appendix 6
Cultural Heritage Management
Plan

Nickol Bay Quarry

Cultural Heritage Management Plan

***M47/26, M47/255, M47/306, M47/309,
M47/331, M47/333, M47/353, G47/23,
G47/42, G47/47, G47/48, G47/171, L47/91***

Prepared by
Holcim

October 2010

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1. BACKGROUND

Holcim Australia Pty Ltd (Holcim), formally CEMEX Australia, and Readymix prior to that, own and operate the Nickol Bay Quarry located on the Burrup Peninsula (within the Dampier Archipelago) (Figure 1). The company provides premixed concrete, aggregates, gravel and sand to the construction industry and have been operating in Australia since 1939. The Nickol Bay Quarry supplies aggregate for concrete which is used in residential and commercial construction, rock for road (base course) and rail (ballast) construction, armour rock and drainage aggregate.

Holcim recognises and respects the significance of the cultural heritage of Indigenous peoples who have historical connections to the land in the vicinity of the Nickol Bay Quarry. This Cultural Heritage Management Plan (CHMP) has been developed to ensure the protection of cultural heritage values in the area around the Nickol Bay Quarry.

In 2007 the Federal Minister for the Department of Environment and Water added portions of the Dampier Archipelago to the National Heritage List under the Environment Protection Biodiversity and Conservation Act 1999. The Nickol Bay Quarry is now bordered by heritage listed land due its cultural significance.

Furthermore in 2005, after consultation with the Department of Environment (DEC), the Environment Protection Authority (EPA) and the Department of Industry and Resources [now the Department of Mines and Petroleum (DMP)], Holcim withdrew 4 areas from its mining leases for conservation purposes (Figure 2). These areas were subsequently included in the national heritage listed area approved by the Federal Minister for the Department of Environment and Water in 2007.

1.1 PURPOSE AND SCOPE

This Cultural Heritage Management Plan (CHMP) has been developed to ensure the protection of cultural heritage values in the area around the Nickol Bay Quarry. The Plan applies to all land within mining leases M47/26, 255, 306, 309, 331, 333, 353 and General Purpose Leases G47/23, 42, 47, 48, 171 and L47/91 including the conservation areas referred to above (Figure 2).

1.2 OBJECTIVES

The objectives of this Cultural Heritage Management Plan are to:

- Establish and implement strategies for identification, maintenance, protection and monitoring of cultural heritage at the Nickol Bay Quarry.
- Implement a plan to manage the individual requirements of identified cultural heritage sites at the Nickol Bay Quarry and maintain the importance and significance that is associated with these sites.
- Involve the Indigenous groups and other relevant stakeholders in the formulation and execution of the management plan to preserve and protect the identified sites from damage while having as little impact to the integrity of the site as possible.

1.3 RELATED DOCUMENTS

This Plan should be read in conjunction with the following documents:

- Nickol Bay Quarry Environmental Management Plan (2010).
- Ngarluma Aboriginal Corporation & CEMEX Australia Pty Ltd - Cultural Heritage Agreement (2009).
- Cultural Heritage Agreement between Thaluntha Pty Limited as trustee for the Wong-Goo-Tt-Oo charitable trust and Holcim (Australia) Pty Ltd (2009).

1.4 HOLCIM'S COMMITMENT TO CULTURAL HERITAGE

Holcim is committed to establishing and maintaining sustainable and mutually advantageous relationships with Indigenous people in the management and protection of the cultural heritage of the Burrup Peninsula.

Holcim is also committed to complying with all requirements under the *Environment Protection Biodiversity and Conservation Act 1999*, the *Aboriginal Heritage Act 1972* and the *Environment Protection Act 1986*.

This will be achieved through the communication and implementation of the Holcim Indigenous Relations Policy (Appendix 2) and this Cultural Heritage Management Plan.

1.5 DEVELOPMENT OF THIS PLAN

This plan is the culmination of intensive archaeological and ethnographic heritage surveys of the Nickol Bay quarry leases and consultation with Indigenous groups. During the course of these heritage surveys and consultations Holcim made changes to the development of the Nickol Bay to avoid Aboriginal heritage sites as far as practicable and received and acted on recommendations from the Indigenous representatives who participated in the process.

The consultation process has involved Holcim sharing draft CHMP material with the Ngarluma Aboriginal Corporation (NAC)¹, the Western Australian Department of Indigenous Affairs and the Department of the Environment, Water, Heritage and the Arts.

¹ The Ngarluma Prescribed Body Corporate (PBC) is called Ngarluma Aboriginal Corporation. As required by the Native Title Act 1993, the PBC was established following the Ngarluma/Yindjibarndi native title determination.

Figure 1 Regional location of Nickol Bay Quarry

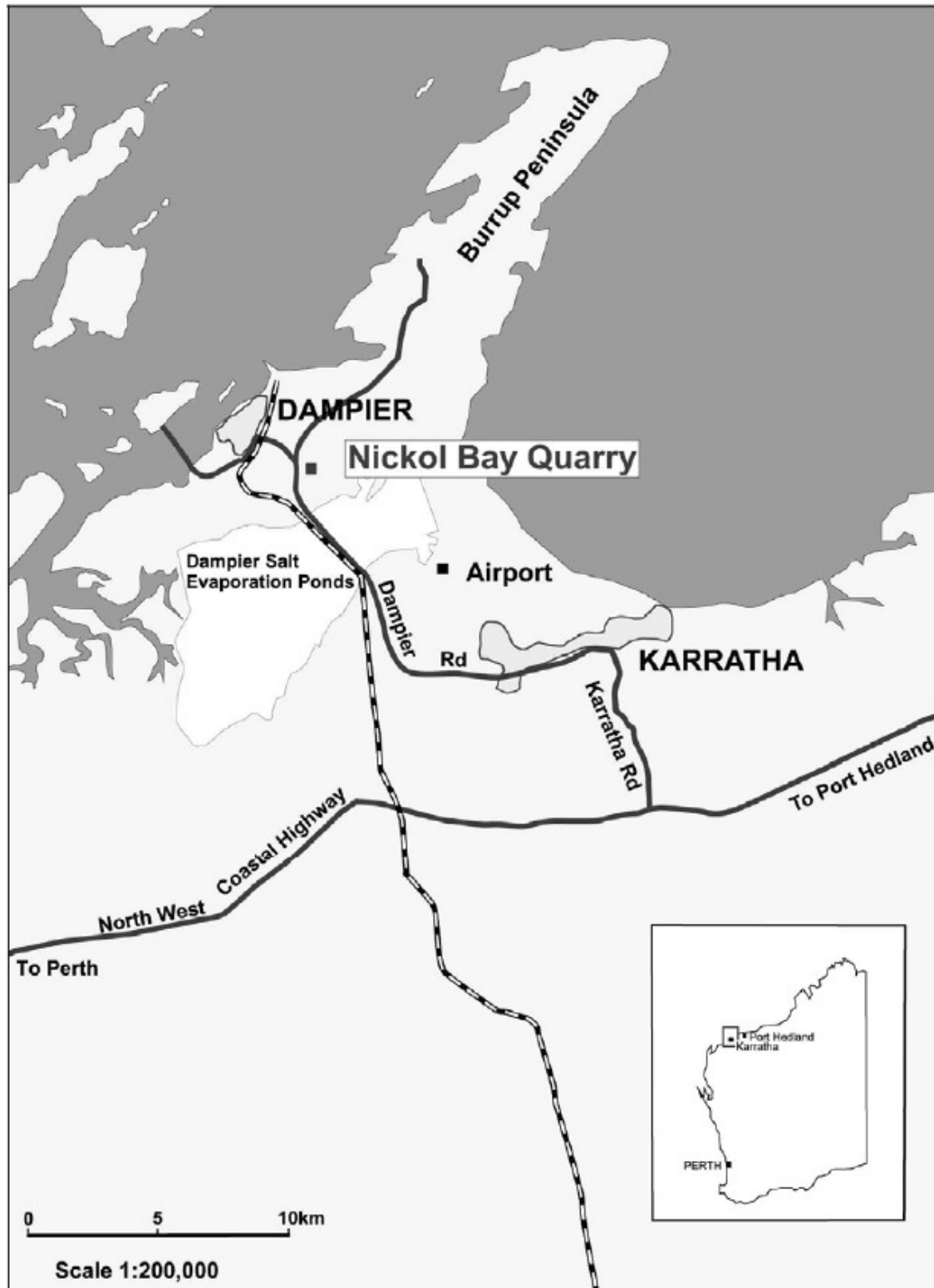
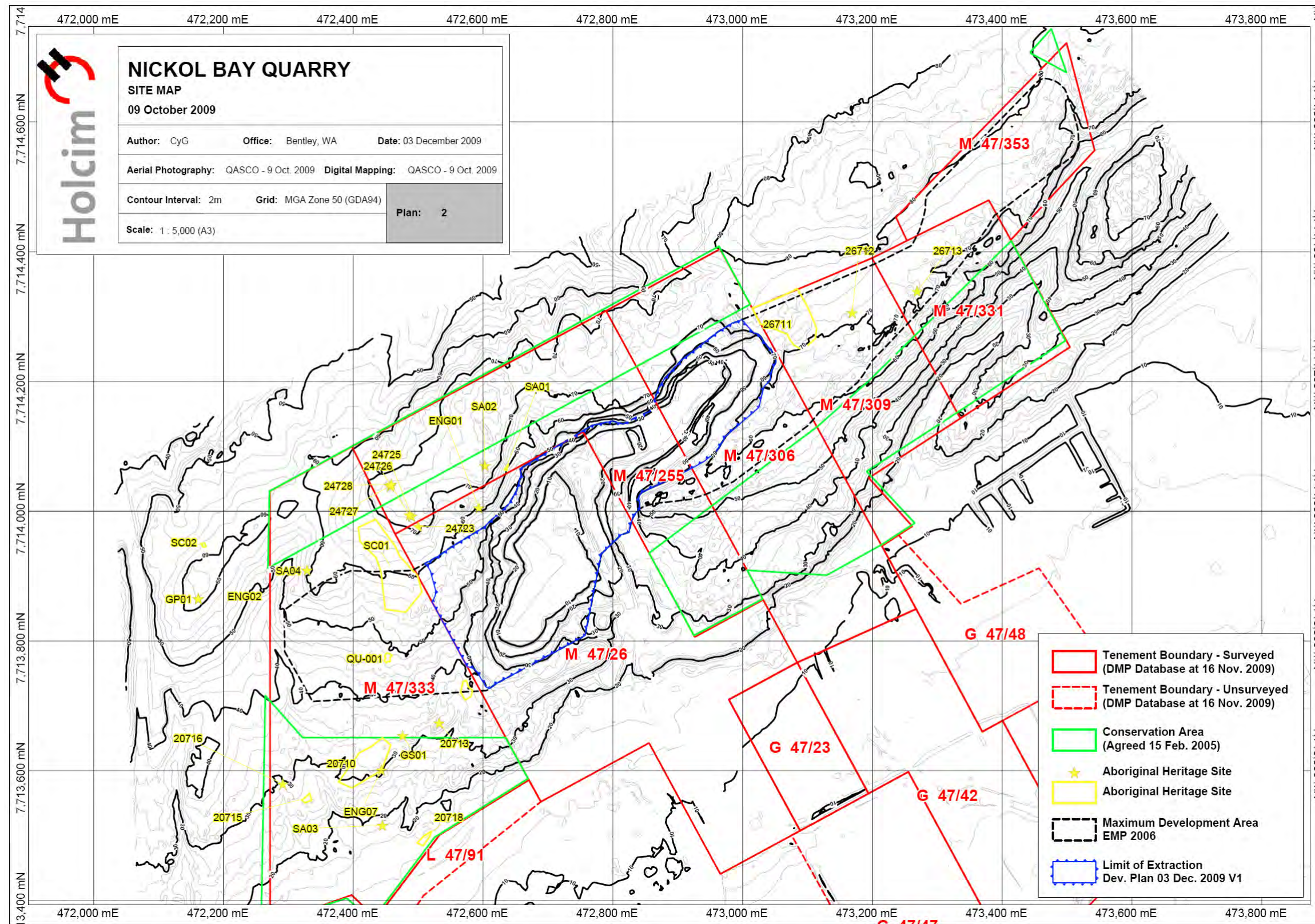


Figure 2 Nickol Bay Quarry tenements



2. IDENTIFICATION, RECORDING AND MANAGEMENT OF HERITAGE SITES

2.1 CULTURAL HERITAGE SURVEYS

Holcim will conduct both archaeological and ethnographic surveys involving the local Indigenous people for the purposes of identifying cultural heritage sites within the Holcim mining leases and a 100m zone surrounding proposed quarrying operations.

Local Indigenous groups will be consulted during the identification and classification of sites, either directly or through the Ngarluma Heritage & Environmental Liaison & Inspection Officer (NEHELIO). Holcim will use the traditional knowledge of Indigenous groups to identify the significance of sites as they are identified.

2.1.1 Previous Heritage Surveys

O'Connor, Rory. 2003. Report on an Ethnographic Survey of Lease M47/333. Unpublished report prepared for CSR Readymix.

This report details the results of an ethnographic survey conducted by Rory O'Connor in conjunction with the Wong-Goo-Tt-Oo native title claimant group on the proposed Western Extension of the Nickol Bay Quarry. The survey identified one previously registered Aboriginal site (ID 8864), and nine new Aboriginal sites (ID 20710, 20711, 20712, 20713, 20714, 20715, 20716, 20717 and 20718). The conclusions of the report detailed that registered Aboriginal sites ID 20711 to ID 20714 flanked the southern extent of the Western Extension of the Nickol Bay Quarry and that registered Aboriginal site ID 20717 was located close to the Western Extension and that it should be fenced, and relocated should work on the quarry commence.

MBS Environmental 2003. Notice under Section 18 of the Aboriginal\ Heritage Act (1972) for the Proposed Western Extension to Nickol Bay Quarry, Burrup Peninsula, Dampier, WA. Unpublished report prepared for CSR Readymix.

This report is a Section 18 report detailing the results of the ethnographic surveys conducted by Rory O'Connor in April and July with the Wong-Goo-Tt-Oo native title claimant group and the Ngarluma-Injibandi native title holders respectively. MBS Environmental compiled the report which covered the proposed Western Extension of the Nickol Bay Quarry for CSR Readymix. The report presented the same results as those detailed in the O'Connor 2003 report (above). The conclusions reiterate those outlined in the O'Connor 2003 report, that with the exception of registered Aboriginal site ID 20717, the remaining sites identified are located outside of the proposed Western Extension.

Australian Interaction Consultants 2006. Report on an Aboriginal Archaeological and Ethnographic Site Identification Survey under the BMIEA for Burrup South, Burrup Peninsula, WA. Unpublished report prepared for Holcim Australia Pty Ltd.

This report details the results of an ethnographic and archaeological survey undertaken by Australian Interaction Consultants of an area defined as BMIEA Burrup South (immediately south and east of the Nickol Bay Quarry, conducted in 2006 in conjunction with the Ngarluma-Injibandi native title holders, and the Wong-Goo-Tt-Oo and Yaburarra & Mardudhunera native title claimants. The survey area overlaps the southern portion of M47/333, however AIC was unable to relocate registered Aboriginal sites ID 8864, 20711,

20712 and 20714. It was the conclusion of the report that Aboriginal site ID 8864 had been disturbed during the construction of the Dampier to Bunbury Gas Pipeline. AIC was able to locate registered Aboriginal sites ID 20710, 20713, 20715 and 20718 within M47/333. It was recommended that the Aboriginal site files and spatial data be updated for registered Aboriginal site ID 20710, 20715 and 20718.

Australian Interaction Consultants 2007. Section 18 Report for proposed Quarry Extension and proposed Stockpile Extension at Nickol Bay, Western Australia. Unpublished report prepared for Holcim Australia Pty Ltd

This report details the results of an ethnographic and archaeological survey undertaken by Australian Interaction Consultants in 2007 in conjunction with the Ngarluma-Injibandi native title holders, and the Yaburarra & Mardudhunera native title claimants on the proposed Nickol Bay Quarry Extension and the Stockpile and G47/171, G47/42, G47/47 and G47/48. The survey identified seven new Aboriginal sites ID 24721, 24722, 24723, 24725, 24726, 24727 and 24728, but was unable to relocate registered Aboriginal sites ID 20711, 20712, 20714 and 20714.

The report concluded that only Aboriginal site ID 24721 would be directly impacted upon by the proposed Western Extension; however Aboriginal sites ID 20713, 24722, 24723, 24725, 24726, 24727 and 24728 may be indirectly impacted upon due to flyrock. Australian Interaction Consultants recommended that any protective measures taken would require a Section 18 application.

Anthropos Australis Pty Ltd & Context Anthropology 2010. The Report of an Aboriginal Heritage Survey of the Proposed Nickol Bay Quarry Western Extension Area, M47/333, Burrup Peninsula, West Pilbara Region, Western Australia.

During the survey, 21 Aboriginal sites were identified within the Survey Area. Eleven of these correspond to already registered Aboriginal sites, and eight were newly identified. Five isolated artefacts were also identified in the Survey Area. Two additional registered sites were identified adjacent to the Survey Area.

Despite intensive examination of the land indicated by the DIA Aboriginal site files (where this information is available), registered Aboriginal site ID, 8858, 8864, 8954, 10572, 20711, 20712, 20714 and 20798 were not relocated within the Survey Area. Registered Aboriginal site ID, 8858, 8864, 8954, 10572 and 20798 are considered to be outside of the Survey Area, with the registered site polygons of these sites overlapping the Survey Area. Registered Aboriginal site ID 20711, 20712 and 20714 appear to have been initially recorded within the Survey Area, but two successive Surveys have not relocated these sites. It is suggested that because of their small size and the ambiguity of the coordinates surrounding these sites (the Datum utilised to record these sites appears to have been incorrect and arbitrarily moved by the DIA), the potential for these Aboriginal sites to be relocated is considered extremely low. Registered Aboriginal site ID 20717 has been tentatively identified within the proposed Western Extension Area and is considered to potentially be newly identified Aboriginal site CEM-09-QU-01 as the site description and the initial mapping by Rory O'Connor (2003) broadly fits the site as recorded. However, one key difference is the absence of any engraving within the site boundaries, despite intensive inspection within the area. The relationship between registered Aboriginal site ID 20717 and Aboriginal site CEM-09-QU-01 remains ambiguous.

Two further registered Aboriginal sites were located outside but adjacent to the Survey Area, and have been recorded to Site Avoidance levels. These are registered Aboriginal site ID 24727 and 24728.

Ten newly identified Aboriginal sites have been located within the Survey Area. These have been given the field identifiers of CEM-09-SC-01, CEM-09-SC-02, CEM-09-SA-01, CEM-09-SA-02, CEM-09-SA-03, CEM-09-SA-04, CEM-09-SA-05, CEM-09-ENG-01, CEM-09-ENG-02, CEM-09-GS-01 and CEM-09-QU-01. Two of these Aboriginal sites, CEM-09-SC-01 and CEM-09-QU-01 are located within the proposed Western Extension Area and have been recorded to Site Identification levels.

2.2 SITE RECORDING & REPORTING

All identified cultural heritage sites shall be recorded in the 'Nickol Bay Quarry – Cultural Heritage Sites Register' and on the 'Nickol Bay Quarry – Cultural Heritage Sites Map' within the MapInfo database. It is the accountability of the Aggregates Planning & Development Team (AP&D) to ensure that this register is maintained and is up to date.

Any newly identified heritage sites must be recorded and registered with the Department of Indigenous Affairs within 1 month of the heritage survey report being received by Holcim. Sites should be recorded and reported as per the DIA guidelines. A copy of the Site Recording form can be downloaded from the DIA website.

The MapInfo database should always be consulted to obtain current versions of these documents. The 'Nickol Bay Quarry – Cultural Heritage Sites Register' shall include the following information for each site:

- Site ID
- Name of the site
- Type of Site i.e. Quarry, artefact scatter, engraving
- Description of site
- Source (i.e. heritage survey information)
- Description of the site and its significance (scope subject to Indigenous sensitivity)
- Proposed management strategy for the site
- Responsibility for management of the site
- Site coordinates (single or area)
- Photograph (if available)
- Type of Site
- Monitoring and reporting associated with the site

The 'Nickol Bay Quarry – Cultural Heritage Sites Register' and 'Nickol Bay Quarry – Cultural Heritage Sites Map' shall be reviewed for accuracy, at minimum annually, and shall be updated following the identification of any new Aboriginal heritage sites.

The 'Nickol Bay Quarry – Cultural Heritage Sites Register' shall be set out in the format below:

Table 1 Cultural Heritage Site Register

Site ID	Name	Type of Site	Site description	Source	Management	Significance
- DIA No	CEM-09-ENG-01	- (i.e. engraving, painting, etc)	Describe the site in detail, what it looks like, why it is significant	- Title of the Survey Report	- Advice of the existence of the site; - Avoid with a 20m buffer; - Section 18 application required	- High - Moderate - Unknown

3. RESPONSIBILITY & ACCOUNTABILITY

3.1 GENERAL RESPONSIBILITIES

The North West Area Manager has been delegated the role of Indigenous Relations Officer for the North West business including the Nickol Bay Quarry. This delegation has been made due to the Area Manager being the most senior person in the business and therefore has the ability to make high level decisions. The Area Manager will receive advice and support from the Ngarluma Heritage & Environmental Liaison & Inspection Officer (NHELIO), specialist Indigenous relation consultants and the Aggregates Planning & Development (AP&D) team.

It is the responsibility of the North West Area Manager to ensure that all employees and contractors at the Nickol Bay Quarry understand the commitments and requirements of this Cultural Heritage Management Plan and to ensure that this Cultural Heritage Management Plan is fully implemented.

It is the responsibility of all employees and contractors at the Nickol Bay Quarry to comply with all elements of this Cultural Heritage Management Plan.

Representatives from the Ngarluma, Yindjibarndi, Yaburarra, Mardudhunera and Wong-Goo-Tt-Oo groups are responsible for:

- Monitoring the retrieval and relocation of heritage material.
- Monitoring ground disturbing works on previously undisturbed land(s).
- Meeting with Holcim to monitor and review the implementation of the CHMP.

3.2 SPECIFIC RESPONSIBILITIES

A Cultural Heritage Responsibilities Matrix (below) has been developed to clearly outline the responsibilities of each employee and contractor associated with the Nickol Bay Quarry. The matrix indicates job titles of the employees in the organisation and a list of cultural heritage related tasks. A matrix such as this enables a simple method for identifying responsibilities towards cultural heritage.

General cultural heritage responsibilities of all employees/contractors will be communicated as part of the induction process (upon employment/engagement) and bi-annual re-induction.

Job specific cultural heritage responsibilities and authorities will also be defined in applicable job descriptions, operating procedures and work instructions.

Table 2 Responsibilities Matrix

	Country President	Western Region Vice President	Manager – North west	North West Quarries Operations Manager	Quarry Manager	Indigenous Relations Officer	Approvals, Planning & Development Team	SHE Coordinator	Contractors	All employees	NHELIO Consultant
Develop, review and update Holcim Indigenous Relations Policy	✓										
Understand Indigenous Relations Policy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Understanding of cultural heritage legal requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Identification of Cultural Heritage Sites			✓	✓	✓	✓	✓				✓
Reporting and registering of Aboriginal Heritage sites with the DIA			✓			✓	✓				
Knowledge and awareness of cultural heritage sites and procedures if new sites are found and avoiding site disturbance		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Establish and maintain Cultural Heritage Sites Register							✓				
Develop and implement Cultural Heritage induction and training packages			✓	✓		✓					✓
Communication and liaison with local Indigenous groups			✓			✓	✓				✓
Physical delineation of Conservation Zones				✓	✓		✓				
Working in accordance to Work Instructions & Procedures			✓	✓	✓	✓	✓	✓	✓	✓	✓

	Country President	Western Region Vice President	Manager – North west	North West Quarries Operations Manager	Quarry Manager	Indigenous Relations Officer	Approvals, Planning & Development Team	SHE Coordinator	Contractors	All employees	NHELIO Consultant
Monitoring of quarry activities with involvement from local Indigenous people			✓	✓	✓	✓	✓				✓
Organising Audits of Cultural Heritage Management			✓	✓	✓	✓	✓				
Management reviews of Cultural Heritage Management Plan		✓	✓	✓	✓	✓					✓
Review and adherence to Cultural Heritage Agreements			✓	✓	✓	✓	✓				✓
Review & update of the Cultural Heritage Site Register and Map					✓		✓				

3.3 RESOURCES

It is the North West Area Managers responsibility to ensure that this Cultural Heritage Management Plan is supported with adequate resources (people, money, and time) and clear lines of authority.

4. OPERATIONAL PROCEDURES TO PROTECT CULTURAL HERITAGE

In addition to the general requirements of this Cultural Heritage Management Plan, the following operational procedures and requirements shall be implemented and complied with to ensure the protection of any identified cultural heritage sites and the National Heritage Values of the Dampier Archipelago (including Burrup Peninsula).²

4.1 GENERAL REQUIREMENTS

- Meet all obligations as specified in any Cultural Heritage Agreements with local Indigenous groups.

4.2 PLANNING PHASE

- Provide a copy of the "Works Proposal"³ to the Aggregates Planning & Development team (AP&D) for cross referencing against the "Nickol Bay Quarry – Cultural Heritage Sites Register", DIA register and Quarry Development Plans.
- Following advice from the AP&D team, provide a copy of the "Works Proposal" to the Indigenous representatives for comment on monitoring / additional survey requirements⁴.
- If the area has not been surveyed in the past, a qualified archaeologist will be engaged to undertake appropriate archaeological and ethnographic surveys with the consultation and appropriate involvement of the Indigenous peoples (as per the relevant Heritage Agreements). During the survey, site significance must be identified in consultation with the relevant Indigenous representatives.
- Identified cultural heritage sites shall be clearly marked on mining lease maps and in the "Nickol Bay Quarry – Cultural Heritage Sites Register". Appropriate physical delineation of any known cultural heritage sites will be implemented in consultation with the local Indigenous groups. Identified cultural heritage sites must be reported to the Department of Indigenous Affairs (DIA) as per the DIA's reporting requirements (refer to the DIA website).
- All proposed development areas at the Nickol Bay Quarry shall be clearly marked in accordance with Holcim's Boundary Pegging and Ground Disturbance Procedures.
- Applicable government approvals (e.g. DIA – Section 18 permits etc) shall be obtained prior to any works commencing that could impact on identified cultural heritage sites. All other avenues for preservation of the identified cultural heritage sites shall be fully explored prior to applying for a Section 18 permit. Consultation with the relevant Indigenous groups must be undertaken in prior to lodgement of any Section 18 application.

² Where operational procedures exist in Cultural Heritage Agreements with local Indigenous groups, those procedures will supersede the generic procedures below.

³ "proposed" development refers to any new development area where ground has not been previously disturbed

⁴ NAC must be provided with a copy of the proposal 20 days prior to development – refer to NAC Heritage Agreement for details

4.3 DEVELOPMENT PHASE

- All conservation zones and/or heritage sites within the mining leases will be clearly defined and marked.
- Quarry development will be carried out in strict compliance with approved development plans.
- Indigenous representative will be invited to “monitor” clearing and site preparation works (as per relevant Cultural Heritage Agreements).
- Drilling and blasting shall be conducted in accordance with Holcim’s Drill and Blast Management Plan.
- Upon completion of any ground disturbance a record of the inspection by the local Indigenous representatives shall be made (see Appendix 4). In addition drilling and blasting operations shall within the realms of occupational health and safety, also be monitored by applicable representatives from the local Indigenous groups when blasting is within 20 metres of a known cultural heritage site.
- Should any aboriginal artefacts or skeletal remains be found at any time, work will cease and appropriate authorities will be informed as per the contingency procedures outlined in the ‘Aboriginal Heritage Plan’ within the Nickol Bay Quarry Environmental Management Plan (refer to Appendix 3) of this document for a copy).

4.4 MONITORING

- In accordance with any applicable Heritage Agreements, the Holcim Indigenous Relations Officer shall, with the involvement of local Indigenous elders, undertake monitoring of known cultural heritage sites and/or proposed development works within Holcim’s mining leases to ensure that activities are not having an adverse impact upon cultural heritage (Appendix 9).
- Monitoring will also occur in accordance with the ‘Aboriginal Heritage Plan’ within the Nickol Bay Quarry Environmental Management Plan (Appendix 3).
- At a minimum monitoring will occur during ground clearing and initial excavation works and during relocation of any aboriginal sites (as approved under a Section 18 notice of the AHA).

4.5 REPORTING

- Results of periodic inspections and records of environmental incidents will be included in the Progress and Compliance Reports to Department of Environment & Conservation. Significant incidents will be reported immediately to the Karratha Regional Office of the DEC, as well as to the DIA and to Indigenous representatives.

4.6 AUDITING

- Compliance with this Cultural Heritage Management Plan shall be audited externally at least every three years and internally at least annually.

4.7 REVIEW

The Nickol Bay Quarry Cultural Heritage Management Plan will be updated annually and formally reviewed every 3 years.

The review shall include appropriate consultation with local Indigenous groups and be conducted to determine that the CHMP is consistent with the National Heritage Management Principles and Heritage Agreements between Holcim and local Indigenous groups and that it adequately and effectively contributes to protecting cultural heritage sites at the Nickol Bay Quarry and the National Heritage Values of the Dampier Archipelago (including Burrup Peninsula).

5. TRAINING

The following specific Cultural Heritage training modules shall be developed and delivered to Holcim's senior leaders and all employees and contractors that work at the Nickol Bay Quarry:

Table 3 Training Matrix

Training Module	Required Attendees	Training Frequency
General Cultural Heritage Awareness and legal requirements	Employees and Contractors	Within 3 month of employment
Cultural Heritage Induction	Employees and Contractors	Annually
Cultural Heritage Induction	Senior Leaders	As employed
Cross-cultural and Aboriginal Sites Recognition Workshops	Senior staff and other relevant staff and contractors with direct involvement in the operations	Within 3 months after commencement of any heritage agreements

Representatives of the Ngarluma people will deliver and provide training as per the requirements of the Heritage Agreement between Holcim and the Ngarluma Aboriginal Corporation (NAC).

Representatives of the Wong-Goo-Tt-Oo people will deliver and provide training as per the requirements of the Heritage Agreement between Holcim and the Wong-Goo-Tt-Oo.

All training records shall be maintained in accordance with Holcim SHE Management System Procedures.

6. COMMUNICATION & CONSULTATION PROCESSES

A number of different consultation strategies are employed at Holcim, ranging from one-on-one discussions to formal board meetings depending on the issues being discussed. Consultation procedures will also vary slightly depending on the Indigenous group and the maturity of the relationship the business has with the group. The following section summarises the standard consultation procedures to be applied at Nickol Bay.

6.1 GENERAL

- All internal and external communications relating to cultural heritage shall be managed in accordance with Holcim SHE Management System Procedures.
- Holcim's Indigenous Relations Officer/North West Area Manager shall manage all communications with the local Indigenous groups and facilitate all site visits by local Indigenous groups (including for the purposes of delivering training).
- Internal records shall be kept regarding formal and informal communication with Indigenous representatives (refer to Table 4 for example).
- Holcim will seek consent from Indigenous representatives prior to releasing any information to third parties including the DIA.
- Holcim respects the information provided by Indigenous groups during the management of cultural heritage and specifically archaeological and ethnographic surveys. Holcim will consult with Indigenous groups prior to releasing or providing any information regarding cultural heritage to third parties.

Table 4 Communication Record Example

Date of consultation	Stakeholder group	Matters Discussed	Outcomes
11 th February	Ngarluma Aboriginal Corporation	Presented Section 18 Application for Western Extension	Agreed on S18 Conditions, amended CHMP, agreed on NHELIO appointment conditions
19 th March	Ngarluma Aboriginal Corporation	Joint review of Cultural Heritage Management Plan, EMP and development plans for Western Extension	Amend CHMP as per NAC comments, Prepare proposal for NHELIO position
8 th July	Ngarluma Aboriginal Corporation	Meeting with the NAC Board to discuss Section 18 conditions, Quarry Development plans, Annual Environmental Reporting requirements	Joint Heritage & Environmental Committee to be established. Recommendations to be prepared for NAC board
15 th July	Heritage & Enviro. Committee	Annual Environmental Report Review, Review of Development Plans. Review of Rehabilitation Plan, Preparation of NHELIO Role description	See meeting minutes for NAC Board Recommendations

6.2 CONSULTATION PROCEDURES

Detail on how consultation will occur with specific Indigenous groups associated with Nickol Bay is outlined in the relevant Cultural Heritage Agreements. The following section provides a generic summary of the processes to be applied for specific issues encountered.

Holcim believes that ongoing and meaningful consultation with Indigenous groups is essential for ensuring an enduring and strong working relationship. In addition to the measure discussed below the Indigenous Relations Officer / North West Area Manager maintains a frequent and open dialogue with nominated Indigenous representatives via telephone and personal visits.

6.2.1 New Developments / Works Programs

- Indigenous groups are formally advised in writing of all "Works Proposals". The Indigenous Relations Office / North West Area Manager will follow-up with a telephone call to discuss the details.
- Holcim requests a meeting with the Indigenous representatives to discuss the proposed work and any survey or monitoring requirements that may be necessary. During this meeting the Indigenous representative/s and Holcim will jointly decide on how to proceed i.e. undertake a heritage survey or authorise the work under the guidance of "Heritage Monitors".
- Holcim and the Indigenous groups will jointly agree to the conditions of the development in accordance with relevant Heritage Agreements.
- All works programs will be implemented in accordance with the jointly agreed conditions.
- Holcim will provide feedback to the Indigenous groups on how the works program has progressed.

6.2.2 Section 18 Applications

- A copy of the draft Section 18 notice (and all attachments) is provided to the Indigenous groups at least 20 days prior to the lodgement date of that notice.
- Holcim requests a meeting with the Indigenous representatives, the appointed Anthropologists and heritage consultants to discuss the draft notice and associated conditions.
- Holcim and the Indigenous representative will jointly agree on the Section 18 conditions.
- Immediately following the DIA's decision on the Section 18 notice, a copy of the decision report is to be provided to the Indigenous groups.
- Holcim and the Indigenous representatives jointly decide on how to implement conditions associated with the Section 18 notice.

6.2.3 Cultural Heritage Agreements

- Holcim will endeavour to engage in Heritage Agreements with local Indigenous groups.

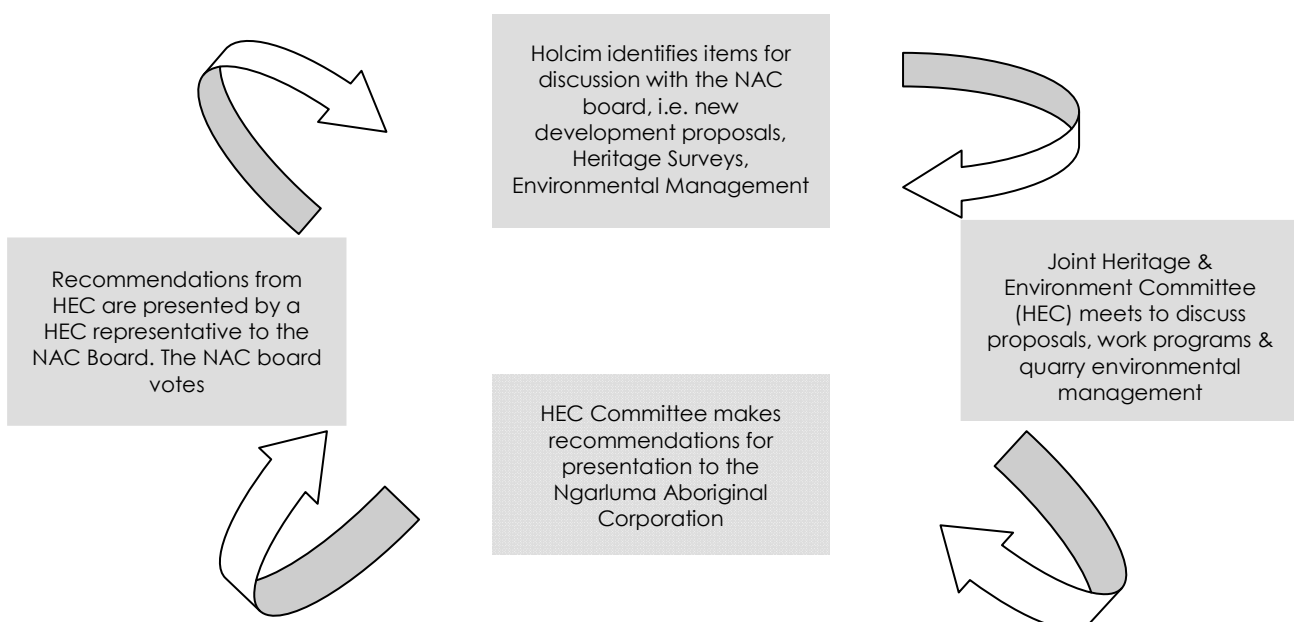
- A formal review of the each Cultural Heritage Agreement is undertaken in consultation with the Indigenous representatives. The frequency of reviews is outlined in the relevant Agreements.

6.2.4 Ngarluma & Holcim – Joint Heritage & Environment Committee

Holcim has established a joint Heritage and Environmental Committee (HEC) with Ngarluma Aboriginal Corporation. The primary objective of HEC is to collaborate on the development and implementation of environmental and cultural heritage management measures and quarry development plans. The committee meets at the Nickol Bay Quarry quarterly to work together on the following topics (and such other topics as put forward by NAC and/or Holcim):

- Development and implementation of environmental management plans and procedures
- Development and review of the Quarry environmental risk register
- Consultation on ways to avoid potential impacts on waterways
- Joint review of environmental audit results
- Joint review of environmental incidents
- Joint preparation of environmental Objectives and Targets
- Joint review clearing activities and consultation on how to minimise vegetation clearing in the Quarry area
- Joint review of quarry development plans and consultation on how to minimise the impact of the quarry
- Discussion of any planned operational changes (i.e. installation of new plant and equipment)
- Joint review of Cultural Heritage Training Schedule
- Joint review of Cultural Heritage Management Plan and procedures
- Joint review of the Blast Management Plan and procedures
- Identification of actions going forward.

Recommendations for presentation to the NEC Board are prepared by HEC. The NAC Board decides on the acceptance of the recommendations and provides feedback to the HEC committee.



DISPUTE RESOLUTION

One of the difficulties that may be encountered when attempting to manage Cultural heritage sites may be disputes between Indigenous groups, and / or disputes between Indigenous stakeholders, other stakeholders and Holcim.

Disputes involving Indigenous groups will be managed by Holcim on a case by case basis. The North West Area Manager / Indigenous Relation Officer will be accountable for seeking the necessary specialist advice and implementing a plan for resolution.

The Australian Heritage Commission (2002⁵) has released various guidelines on managing Indigenous heritage places and values. The following items should be taken into consideration when managing a dispute with an Indigenous group.

Where groups are in dispute;

- Focus on developing ways of protecting heritage that can be agreed to by all parties.
- Consider taking a precautionary approach. Protection of Indigenous heritage values is important no matter what competing claims are made.
- Do not become involved in disputes between Indigenous groups because Indigenous disputes need to be resolved at the community level.
- Be prepared to assist and possibly resource an appropriate independent person or body to facilitate resolution of the dispute.
- Do not try and impose unrealistic timeframes for resolving community disputes.

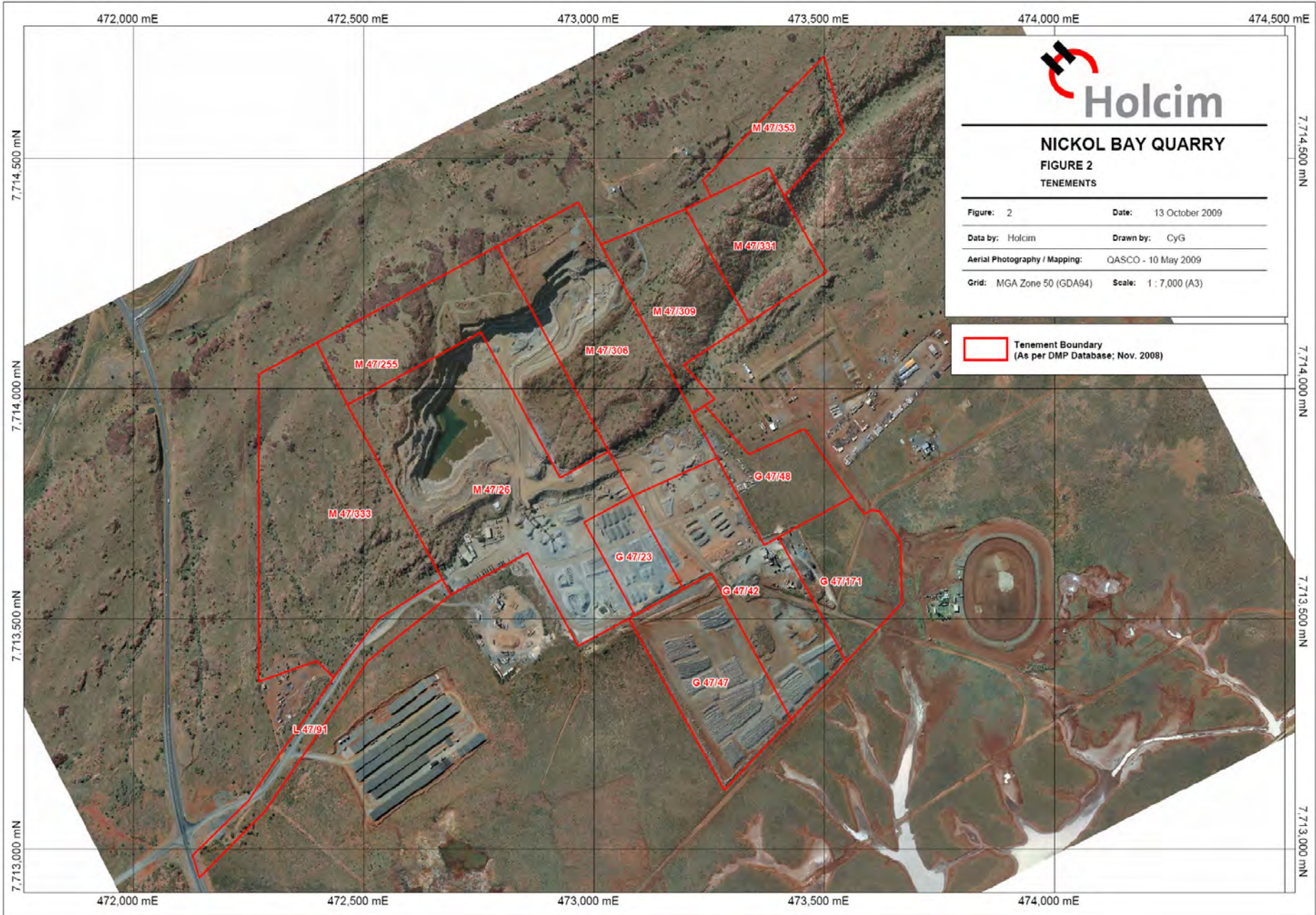
When dealing with disputes between an Indigenous group, Holcim and other stakeholders;

- Identify formal and informal dispute resolution processes.
- Identify and consider using culturally appropriate forms of dispute resolution (for example, meeting on country).
- Encourage everyone to use informal processes.
- Do not try and impose unrealistic timeframes for resolving disputes.
- consult with smaller groups rather than large meetings.

When dealing with the Ngarluma Aboriginal Corporation (NAC), dispute resolution will be managed via the joint Heritage & Environment Committee (HEC).


⁵ Australian Heritage Commission (2002). Australian Ask First - A guide to respecting Indigenous heritage places and values.

Appendix 1: Nickol Bay Quarry Mining Leases



NICKOL BAY QUARRY
FIGURE 2
TENEMENTS

Figure: 2	Date: 13 October 2009
Data by: Holcim	Drawn by: CyG
Aerial Photography / Mapping: QASCO - 10 May 2009	
Grid: MGA Zone 50 (GDA94)	Scale: 1 : 7,000 (A3)

 Tenement Boundary
 (As per DMP Database; Nov. 2008)

7.714.500 mN
7.714.000 mN
7.713.500 mN
7.713.000 mN

472,000 mE 472,500 mE 473,000 mE 473,500 mE 474,000 mE 474,500 mE

7.714.500 mN
7.714.000 mN
7.713.500 mN
7.713.000 mN

472,000 mE 472,500 mE 473,000 mE 473,500 mE 474,000 mE 474,500 mE

Appendix 2: Holcim Indigenous Relations Policy



Indigenous Relations Policy

General Policy

Holcim (Australia) Pty Ltd (Holcim) believes the development of positive long term relationships with indigenous communities is necessary for our business success.

Objective

Holcim is committed to establishing and maintaining sustainable and mutually advantageous relationships with indigenous communities wherever it operates.

This will be achieved by

- Recognising and respecting Australia's indigenous people;
- Recognising and respecting the significance of the cultural heritage of the indigenous people who may have historical connections to the land on which our businesses operate;
- Working closely with local indigenous groups in planning, maintaining and closing our operations;
- Understanding and taking into account indigenous people's perceptions of the social consequences of our activities;
- Assisting indigenous people to compete for employment opportunities within Holcim;
- Seeking opportunities for indigenous communities to participate in Holcim's operations through commercially competitive, contractual and other cooperative ventures; and
- Supporting partnerships that have a positive impact on local indigenous communities.

Responsibilities

It is the responsibility of the Country President to ensure the appropriate and effective implementation of this policy throughout Australia.

It is the responsibility of the most senior local manager to implement this policy within each local area.

All employees have the responsibility to support this policy.

Peter James
President, Holcim (Australia) Pty Ltd

Appendix 3: Aboriginal Heritage Plan – Extract from Nickol Bay Quarry EMP

7. ABORIGINAL HERITAGE MANAGEMENT PLAN

This Management Plan shall be implemented in conjunction with the Nickol Bay Quarry Cultural Heritage Management Plan (Appendix 10).

7.1 DESCRIPTION

Several Aboriginal heritage sites are present within Nickol Bay Quarry tenements. Options for heritage sites which are situated in the proposed quarry footprint (extension areas) are currently being investigated. One or more of the following actions may be implemented in regard to these sites:

- Relocate site material to land outside of the quarry extension area, or protected through other means, in consultation with local Aboriginal representatives.
- Modify the proposed quarry extensions to avoid Aboriginal sites and provide an adequate buffer zone around the Aboriginal sites.
- Apply for approval to disturb sites under section 18 of the *Aboriginal Heritage Act 1972* (WA)

All actions regarding Aboriginal heritage sites are undertaken in consultation with local Aboriginal representatives and the Department of Indigenous Affairs (DIA), in accordance with the *Aboriginal Heritage Act 1972*.

7.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the quarry operation have been identified as requiring management to ensure protection of Aboriginal heritage values:

- clearing
- human access
- blasting
- vibration
- dust emissions.

7.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

This plan details management procedures to protect Aboriginal Heritage sites on granted tenements during operation of the Nickol Bay Quarry, both within and in proximity to active project areas. The performance standard in relation to Aboriginal sites for the project is to protect all Aboriginal sites in accordance with the provisions of the *Aboriginal Heritage Act 1972*.

The management objective for Aboriginal heritage is:

- To avoid disturbance to Aboriginal heritage sites.

7.4 IMPLEMENTATION STRATEGY

7.4.1 Management actions

Day to day responsibility for compliance with this Plan will be held by the Site Supervisor(s) as delegated by the Quarry Manager. Responsibility for achieving compliance with the EMP and reporting requirements will be undertaken by the Quarry Manager with assistance from the Holcim SHE Coordinators.

The following management actions will be implemented in order to meet the objectives of the Plan (Table 14):

Table 14 Management actions for Aboriginal heritage

Parameter	No	Action	Timing	Responsibility
Information	AH1	<p>Include in induction program for all quarry personnel (including contractors) information on:</p> <ul style="list-style-type: none"> • significance of Aboriginal heritage and the potential impacts of the project • procedures to report potential new sites • obligations under the <i>Aboriginal Heritage Act 1972</i> (WA) • requirements for the protection of known Aboriginal sites. • procedures in the event of disturbance of a known heritage site and/or the discovery of a suspected heritage site 	Induction and training of staff and contractors	Quarry Manager
	AH2	Establish and maintain a register of sites of Aboriginal significance within the site, including GIS records of site locations, and site descriptions. Make this register available to contractors and relevant employees, except in the case that Aboriginal people or DIA wish for site locations to remain undisclosed (see AH3).	Within 6 months of implementation of this EMP	Quarry Manager
	AH3	Keep confidential the precise location of sites recorded in heritage surveys undertaken on behalf of Holcim if requested by Aboriginal representatives or the DIA. No public release of any such site specific information will be undertaken without express permission of the DIA.	At all times	Quarry Manager
Site protection	AH4	Flag and/or fence the boundaries of Aboriginal sites in the vicinity of construction or operation areas to ensure activities do not intrude into areas where Aboriginal sites are present.	During operations	Quarry Manager
	AH5	Implement contingency actions in Table 15 in the event of disturbance to a known heritage site	At all times	Quarry Manager
	AH6	Implement contingency actions in Table 15 in the event of discovery of a suspected heritage site	At all times	Quarry Manager
	AH7	Dismiss personnel who are not authorised to deliberately disturb identified Aboriginal sites Advise relevant authorities of the disturbance.	At all times	Quarry Manager
Communication	AH8	Conduct all dealings with Aboriginal Groups with reference to the Holcim Guidelines for Community Awareness (SHE 4.6), and in accordance with heritage agreements between Holcim and the Traditional Owners	At all times	Quarry Manager
	AH9	Notify the DIA of the outcome of on-site meeting(s) held between Holcim, Aboriginal consultants and relevant Aboriginal Groups regarding the management of identified significant sites.	After meetings	Quarry Manager
	AH10	Maintain regular ongoing communication with representatives of local Aboriginal groups, and ensure consultation and involvement of the local Aboriginal people occurs in matters of heritage management	At all times	Indigenous Relations Officer

7.4.2 Contingency actions

Table 15 Contingency actions for Aboriginal heritage

Trigger	Action
Site disturbance of known heritage site	<ol style="list-style-type: none"> 1. Stop work immediately 2. The person responsible for, or first on the scene of, the incident will notify the Quarry Manager 3. Investigate the cause of the incident, the level of severity, and all other relevant information noted 4. Record the incident in an Environmental Incident Report form 5. Report the incident to regulatory authorities (DIA) and relevant Aboriginal stakeholders 6. Implement corrective actions to mitigate harm in consultation with the DIA and Aboriginal stakeholders 7. Review and revise heritage management measures as appropriate to prevent recurrence.
Detection of suspected Aboriginal heritage site (previously unrecorded)	<ol style="list-style-type: none"> 1. Immediately cease all works in the area and inform the Quarry Manager 2. Erect fence/flagging /barrier around the potential heritage site including a 10 m buffer with 'Keep Out' signage until further advice is received. 3. Determine the authenticity of the site or material using appropriate methods, in consultation with relevant stakeholders. A qualified archaeological consultant, who has been issued with a Section 16 under the <i>Aboriginal Heritage Act</i> will assess the significance of the site and determine the next course of action, in accordance with the wishes of the Aboriginal Community. 4. Notify the DIA in accordance with section 15 of the <i>Aboriginal Heritage Act, 1972</i> through completion of an Aboriginal Site Recording Form (available from the DIA website). The DIA must be notified of the site within a timely manner, preferably within seven days of discovery of potential site. Notify police if skeletal remains are involved. 5. Record details of the site discovery for internal management records, including: <ol style="list-style-type: none"> (a) date and time of the discovery (b) method by which the site was uncovered, and the project activities occurring at the time (c) site description / nature of the site (d) nature of investigations taken in relation to the potential site (e) action taken in relation to the site (including supplementary monitoring and corrective actions) (f) reasons for taking no action in relation to the site (if such a decision was made) (g) outcomes of the process. 6. Update the Nickol Bay Cultural Heritage Sites Register 7. Update induction material for quarry personnel as required. 8. Implement suitable mitigation/management measures as soon as practicable once agreed upon by stakeholders. 9. Investigate potential for site avoidance. Where disturbance to the site can be avoided (e.g. via reconfiguration of the development), actions may include compiling a detailed site record, collection of the cultural material or protection of the site (e.g. fencing). 10. Where avoidance is not practicable, seek consent to disturb the site from the Minister for Indigenous Affairs through a Section 18 application under the <i>Aboriginal Heritage Act 1972</i> (WA), in consultation with the Native Title holders. Prior to making an application under the <i>Aboriginal Heritage Act 1972</i> (WA), ensure that detailed archaeological recording of the relevant site is conducted by a qualified archaeologist, and consult in good faith with to determine acceptable methods by which site may be disturbed. If required, the necessary clearances to disturb the site will be obtained under Section 18 of the <i>Aboriginal Heritage Act</i>.

7.5 MONITORING AND REPORTING

Monitoring

Table 16 provides monitoring actions to enable an assessment of the effectiveness of the Aboriginal heritage management actions in place. Monitoring is, for the most part, the responsibility of the Quarry Manager.

Table 16 Monitoring actions for Aboriginal heritage

Objective	Target	Description of monitoring	Monitoring record	Frequency/timing
To monitor the condition of known heritage sites	No unauthorised site disturbance	Visual inspections of known heritage sites from the boundary of heritage site, in accordance with site-specific requirements as indicated by Aboriginal representatives or the DIA	Quarterly inspection report	To be determined in consultation with local indigenous groups
To monitor ground-disturbance in collaboration with local indigenous representatives	No unauthorised site disturbance	Monitoring ground clearing and initial excavation works within project area in collaboration with local indigenous representatives Monitor relocation of any aboriginal sites (as approved under a Section 18 notice of the AHA) in collaboration with local indigenous representatives	Quarterly inspection report	To be determined in consultation with local indigenous groups
To monitor drilling and blasting operations in collaboration with local indigenous representatives	No unauthorised site disturbance	Provide opportunity for local indigenous groups to monitor drilling and blasting operations (within occupational health and safety constraints) when blasting is within 21 metres of a known cultural heritage site.	Quarterly inspection report	To be determined in consultation with local indigenous groups
To monitor the effect of vibration on loose rock piles	No impact from blasting on Aboriginal heritage sites	Photographic monitoring heritage sites. Baseline photos to record the state of the site, followed by photo's taken at six monthly intervals, or after significant weather events, when blasting is further than 100m away	Six monthly inspection	Six monthly
To monitor actual disturbance against approved disturbance footprint	No unauthorised site disturbance	Reconciliation of approved clearing with actual clearing	Quarterly inspection report	Quarterly

Reporting

Prior to ground disturbance monitoring with local indigenous representatives will occur. Upon completion of any ground disturbance a record of the inspection by the local indigenous representatives shall be made.

The location of recorded heritage sites shall be entered into the Nickol Bay Quarry Cultural Heritage Sites Register to ensure marked heritage sites are correctly documented.

Internal records shall be kept regarding formal and informal communication with Aboriginal representatives. The DIA will be notified of the outcome of all meeting(s) held between Holcim and Aboriginal consultants or relevant Aboriginal Groups regarding the management of heritage sites.

Appendix 4: Heritage Inspection Recording Sheet – Template

HERITAGE INSPECTION REPORT

[To be completed by the Monitors and the Liaison Officer, following consultation with the Monitor, where there has been Monitoring of the Tenement Holders activities on land by the Monitors]

1. Monitors names:

2. Group Representing:

2. Monitoring Date and Time

3. Location (attach map to this report): _____

4. GPS coordinates of location (see Annexure A): _____mE; _____mN

Accuracy: _____m"

Handheld GPS

GPS from registered surveyor

Note - GPS settings for the projection must be: MGA / GDA 94 or UTM / WGS 84

5. Tenement holder's and liaison officer's name: _____

6. Tenement number(s): _____

7. Have the Monitors been inducted by the Liaison Officer as to Holcim's Safety Procedures?

Yes

No – If no induction must be undertaken before monitoring can commence

8. Does the Tenement Holders work affect an:

Aboriginal Object

Yes

No

Aboriginal Site

Yes

No

If yes, refer to Anthropologist / Archaeologist

If no, Holcim's activity may proceed. Monitors write down any conditions associated with the conduct and location of the works:

10. Outcomes/Comments of Monitors _____

11. Outcomes/Comments of Liaison Officer on behalf of Holcim and agreement to the Monitors Conditions _____

SIGNED by Nominated Monitors: _____

SIGNED by liaison officer on behalf of Holcim: _____

DATE: _____

NB: Monitors to provide the NAC and the NAC's Anthropologist with a signed copy of the Report.

Appendix 5: Heritage Monitoring Report – Template

HERITAGE INSPECTION REPORT

[Nominated Consultant⁶ in any Heritage Inspection Team to complete this Report and relevant Annexure. Complete a new Report for each day/part day of the Heritage Inspection]

1. "Nominated Consultant's" names:

2. Inspection start and finish times/dates _____

3. Location (attach map to this report): _____

4. GPS coordinates of location (see Annexure A): _____ mE; _____ mN

Accuracy: _____ m"

Handheld GPS

GPS from registered surveyor

Note - GPS settings for the projection must be: MGA / GDA 94 or UTM / WGS 84

5. Tenement holder's and liaison officer's name: _____

6. Tenement number(s): _____

⁶ "Nominated Consultant" means members of the Indigenous Groups People, who in accordance with the aboriginal law and customs, have appropriate knowledge of, and the right to speak for, the areas of a proposed Survey and to participate in a Survey, Heritage Inspection, stop works meeting and/or Monitoring.

7. Description of tenement holder's proposed low impact activity works relevant to this report:

8. Inspect areas with consideration to the proposed low impact activity detailed in the Tenement holder's works proposal (complete Annexure A).

9. Comments on Proposed Works by Nominated Consultants: _____

10. Comments by Liaison Officer: _____

SIGNED by Nominated Consultants: _____

SIGNED by liaison officer on behalf of the tenement holder: _____

DATE: _____

ANNEXURE A

[to be completed by Nominated Consultants and Liaison Officer for the Tenement Holder for inspections of area of land detailed in the Works Proposal for Low Impact Activity]

1. **Have the Nominated Consultants received a copy of the Tenement Holder's Works Proposal?**

YES

NO - obtain from the Aboriginal Liaison Officer

2. **Has inspection of areas of land detailed in the Works Proposal been completed?**

YES

NO

3. **Will the proposed activity associated with the Works Proposal affect an:**

(a) Aboriginal Object?

YES – provide details_____

 NO

(b) Aboriginal Site?

YES - Nominated Consultants to refer Anthropologist for a Survey to be conducted prior to any Works.

NO

4. Has agreement been reached between Heritage Inspection Team and Liaison Officer regarding alteration of the Tenement Holder's proposed activity so that Aboriginal Object and/or site are not disturbed?

YES - Liaison Officer to provide Nominated Consultants with agreed new draft description and map of proposed activity

NO - Nominated Consultants immediately refer to Anthropologist.

5. Do the Nominated Consultants recommend monitoring?

YES - Nominated Consultants immediately refer to Anthropologist to Arrange Monitoring.

NO

6. Has the Heritage Inspection Report and this Annexure A been provided to the Liaison Officer and Anthropologist (if applicable)?

YES

NO - provide to Liaison Officer and Anthropologist (if applicable)

7. Outcome/Comments of Nominated Consultants _____

8. Outcome/ Comments of Liaison Officer _____

SIGNED by Nominated Consultants: _____ -

SIGNED by Liaison Officer on behalf of the tenement holder: _____

DATE: _____

Appendix 7

Amended Licence for Prescribed Premises



AMENDED LICENCE FOR PRESCRIBED PREMISES ***Environmental Protection Act 1986***

LICENCE NUMBER: L4741/1982/11

FILE NUMBER: NWK1984-02

LICENSEE AND OCCUPIER OF PREMISES

Holcim (Australia) Pty Ltd
18 Brodie Hall Drive
Bentley WA 6012

NAME AND LOCATION OF PREMISES

Nickol Bay Quarry
Tenements M47/333, M47/255, M47/309, M47/331, M47/353, M47/26, M47/306, G47/23,
G47/42, G47/47, G47/48, G47/171, L47/91
DAMPIER WA 6713
(as depicted in Attachment 2)

PRESCRIBED PREMISES CATEGORY

Schedule 1 of the Environmental Protection Regulations 1987

CATEGORY	DESCRIPTION	CAPACITY
12	Screening, etc. of material	More than 500 000 but no more than 5 000 000 tonnes per year.

CONDITIONS OF LICENCE

Subject to the conditions of licence set out in the attached 7 pages.

Officer delegated under Section 20
of the *Environmental Protection Act 1986*

ISSUE DATE Thursday, 18 September 2008

COMMENCEMENT DATE: Wednesday, 1 October 2008

DATE OF AMENDMENT: Friday, 24 September 2010

EXPIRY DATE: Monday, 30 September 2013

CONDITIONS OF LICENCE

Environmental Protection Act 1986

LICENCE NUMBER: L4741/1982/11

FILE NUMBER: NWK1982-02

DEFINITIONS

In these Conditions of licence, unless inconsistent with the text or subject matter:

'advise' means advise in writing;

'approved' and 'approval' means approved and approval in writing;

'blasting' means the act of quarrying rock from the ground by the use of explosives, and excludes subsequent screening;

'bund' means an embankment or wall which may form part of the perimeter of a compound;

'compound' means an area bounded by a bund, sufficiently impervious to retain spillages or leakages pending recovery;

'Director' means Director, Environmental Regulation Division of the Department of Environment and Conservation for and on behalf of the Chief Executive Officer as delegated under Section 20 of the Environmental Protection Act 1986;

'Director' and 'Department of Environment and Conservation' for the purpose of correspondence means -

Regional Manager, Pilbara Office

Department of Environment and Conservation

PO Box 835

KARRATHA WA 6714

Telephone: (08) 9182 2000

Facsimile: (08) 9144 1118;

'licensed' means licensed under the *Environmental Protection Act 1986* unless otherwise specified;

'Premises' means tenements M47/333, M47/255, M47/309, M47/331, M47/353, M47/26, M47/306, G47/23, G47/42, G47/47, G47/48, G47/171 and L47/91 as defined in Attachment 2; and

'screening' means the activity under which the premises is prescribed, and includes the screening, washing, crushing, grinding, milling, sizing and separation or material extracted from the ground, dust suppression activities and screen cleaning activities.

AIR POLLUTION CONTROL CONDITIONS

1. The licensee shall ensure that all areas on the premises from which dust may be generated are maintained so that no visible dust crosses the boundary of the premises, except where this dust is generated as a result of blasting.
2. The licensee shall ensure that all conveyor transfer points, including between belts and belts/screens/crushers/storage facilities shall be operated and maintained such that dust emissions are minimised through the implementation of appropriate dust control measures such as:
 - (i) water sprays;
 - (ii) dust extraction/filtration equipment;
 - (iii) belt cleaning mechanisms; and
 - (iv) sealing and enclosing conveyor transfer points where practicable.

ISSUE DATE: Thursday, 18 September 2008

DATE OF AMENDMENT: Friday, 24 September 2010

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CONDITIONS OF LICENCE

Environmental Protection Act 1986

LICENCE NUMBER: L4741/1982/11

FILE NUMBER: NWK1982-02

WATER POLLUTION CONTROL CONDITIONS

3. The licensee shall ensure that the premises are drained such that contaminated stormwater is retained within the quarry and stockpile development areas.
4. The licensee shall ensure that the quality of any wastewater used for dust suppression on the Premises contains a total hydrocarbon concentration of less than 5 mg/L.
5. The licensee shall equip vehicle washdown areas with fuel/oil traps and provisions to ensure detergent or solvent contaminated waters are not discharged to the environment.
6. The licensee shall ensure that any discharge of water from the operational and wash down areas shall be discharged via fuel/oil traps and silt traps.
7. The licensee shall store environmentally hazardous chemicals including, but not limited to, fuel, oil or other hydrocarbons (where the total volume of each substance stored on the premises exceeds 250 litres) within low permeability (10⁻⁹ metres per second or less) compound(s) designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound.
- 8(a). The compound(s) described in part (a) to this condition shall:
 - (i) be graded or include a sump to allow recovery of liquid;
 - (ii) be chemically resistant to the substances stored;
 - (iii) include valves, pumps and meters associated with transfer operations wherever practical. Otherwise the equipment shall be adequately protected (e.g. bollards) and contained in an area designed to permit recovery of chemicals released following accidents or vandalism;
 - (iv) be designed such that jetting from any storage vessel or fitting will be captured within the bunded area [see for example Australian Standard 1940-2004 Section 5.9.3 (g)];
 - (v) be designed such that chemicals which may react dangerously if they come into contact, are in separate bunds in the same compound or in different compounds; and
 - (vi) be controlled such that the capacity of the bund is maintained at all times (e.g. regular inspection and pumping of trapped uncontaminated rain water).
- 8(b). The licensee shall immediately remove and dispose of, to a waste disposal facility that is licensed or registered to accept such wastes, any liquid resulting from spills or leaks of chemicals including fuel, oil or other hydrocarbons, whether inside or outside the low permeability compound(s).
9. The licensee shall collect waste oils, solvents and other liquid wastes in holding tanks for recycling or disposal to a waste disposal facility that is licensed or registered to accept such wastes.

ISSUE DATE: Thursday, 18 September 2008

DATE OF AMENDMENT: Friday, 24 September 2010

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CONDITIONS OF LICENCE

Environmental Protection Act 1986

LICENCE NUMBER: L4741/1982/11

FILE NUMBER: NWK1982-02

REPORTING CONDITIONS

10. The licensee shall by **30 July** in each year, provide to the Director an annual audit compliance report in the form in Attachment 1 to this licence, signed and certified in the manner required by Section C of the form, indicating the extent to which the licensee has complied with the conditions of this licence, and any previous licence issued under Part V of the Act for the Premises, during the period beginning **1 July** the previous year and ending on **30 June** in that year.

ISSUE DATE: Thursday, 18 September 2008

DATE OF AMENDMENT: Friday, 24 September 2010

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ATTACHMENT 1 – ANNUAL AUDIT COMPLIANCE REPORT

LICENCE NUMBER: L4741/1982/11

FILE NUMBER NWK1984-02

SECTION A

LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name:	ABN:
Trading as:	
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of licence complied with within the reporting period? (please tick the appropriate box)

Yes Please proceed to Section C
No Please proceed to Section B

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL: _____

ISSUE DATE: Thursday, 18 September 2008

DATE OF AMENDMENT: Friday, 24 September 2010

ATTACHMENT 1 – ANNUAL AUDIT COMPLIANCE REPORT

LICENCE NUMBER: L4741/1982/11

FILE NUMBER NWK1984-02

SECTION B - DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each licence condition that was not complied with.

a) Licence condition not complied with?	
b) Date(s) when the non compliance occurred, if applicable?	
c) Was this non compliance reported to DEC?	
<input type="checkbox"/> Yes <input type="checkbox"/> Reported to DEC verbally Date _____ <input type="checkbox"/> Reported to DEC in writing Date _____	<input type="checkbox"/> No
d) Has DEC taken, or finalised any action in relation to the non compliance?	
e) Summary of particulars of non compliance, and what was the environmental impact?	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram)	
g) Cause of non compliance	
h) Action taken or that will be taken to mitigate any adverse effects of the non compliance	
i) Action taken or that will be taken to prevent recurrence of the non compliance	

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report
INITIAL: _____

ISSUE DATE: Thursday, 18 September 2008

DATE OF AMENDMENT: Friday, 24 September 2010

ATTACHMENT 1 – ANNUAL AUDIT COMPLIANCE REPORT

LICENCE NUMBER: L4741/1982/11

FILE NUMBER NWK1984-02

SECTION C - SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report may only be signed by a person(s) with legal authority to sign it. The ways in which the Annual Audit Compliance Report must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this Annual Audit Compliance Report is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is	The Annual Audit Compliance Report must be signed and certified:
an individual	<input type="checkbox"/> by the individual licence holder, or <input type="checkbox"/> by a person approved in writing by the Chief Executive Officer of the Department of Environment and Conservation to sign on the licensee's behalf.
A firm or other unincorporated company	<input type="checkbox"/> by the principal executive officer of the licensee; or <input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A corporation	<input type="checkbox"/> by affixing the common seal of the licensee in accordance with the Corporations Act 2001; or <input type="checkbox"/> by two directors of the licensee; or <input type="checkbox"/> by a director and a company secretary of the licensee, or <input type="checkbox"/> if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or <input type="checkbox"/> by the principal executive officer of the licensee; or <input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A public authority (other than a local government)	<input type="checkbox"/> by the principal executive officer of the licensee; or <input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
a local government	<input type="checkbox"/> by the chief executive officer of the licensee; or <input type="checkbox"/> by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of \$50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

SIGNATURE: _____

NAME: (printed) _____

NAME: (printed) _____

POSITION: _____

POSITION: _____

DATE: ____/____/____

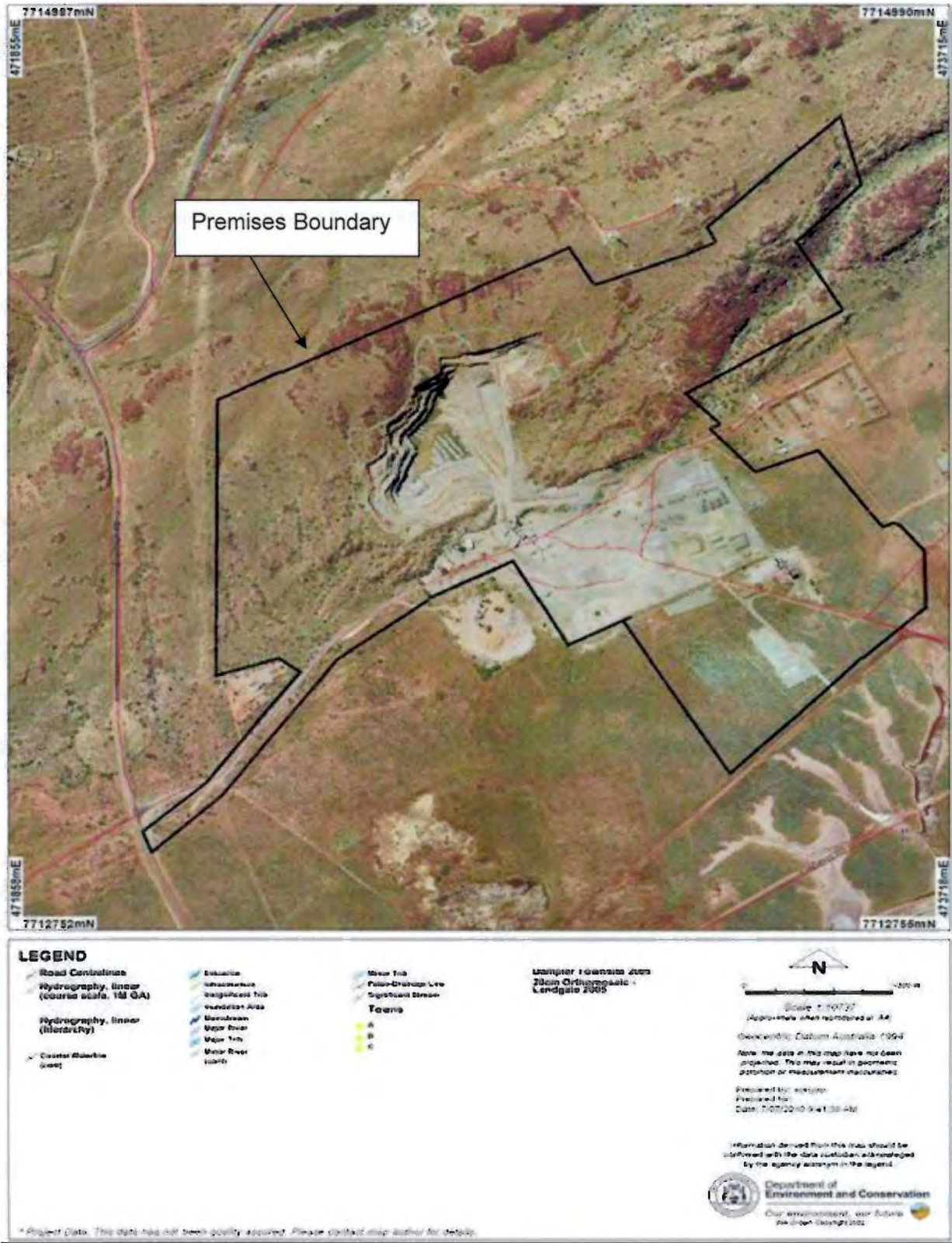
DATE: ____/____/____

SEAL (if signing under seal)

ISSUE DATE: Thursday, 18 September 2008

DATE OF AMENDMENT: Friday, 24 September 2010

PLAN OF PREMISES: NICKOL BAY QUARRY



Appendix 8
Blast Impact Assessment and
Explanatory Notes

TERROCK

Consulting Engineers

TERROCK PTY. LTD.
A.B.N. 99 005 784 841

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Eltham Vic 3095

Phone: (03) 9431 0033
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HOLCIM (AUSTRALIA) PTY LTD

NICKOL BAY QUARRY

BLASTING IMPACT ASSESSMENT

Adrian Moore
28th January 2010

HOLCIM (AUSTRALIA) PTY LTD
NICKOL BAY QUARRY
BLASTING IMPACT ASSESSMENT

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HOLCIM (AUSTRALIA) PTY LTD

NICKOL BAY QUARRY

BLASTING IMPACT ASSESSMENT

EXECUTIVE SUMMARY

The purpose of the Blasting Impact Assessment was firstly to review current blasting operations at the Nickol Bay Quarry and then to determine what improvements are required to prevent damage impacts on Aboriginal Heritage Sites, the conservation zone and any areas outside the tenements.

The review included assessing and analysing the environmental impacts of the blasting operations conducted at the Holcim Nickol Bay Quarry during 2009 to determine the possible future impact on Aboriginal Heritage Sites and the adjoining conservation zones. Included in the investigation was identification of the significant factors that could be controlled to limit the environmental impacts from future blasting to acceptable levels.

The Aboriginal Heritage Sites described within and adjacent to the proposed extraction have been defined as “engravings, quarry, artefacts and artefact scatter, a man made structure, stone arrangement, grinding platform, large scale site complex”.

The impacts of blasting were determined by:

- Ground vibration measurements
- Face movement observation and measurement
- Stemming ejection observation and throw measurement
- Overbreak observation and measurement
- Observation of the stability of rock faces adjoining the blast

The observations were compared to models described in the literature and were used to quantify and calibrate the contributing parameters. Site specific Environmental Blast Design models have been developed so that blasting specifications for future blasts can be determined to ensure that:

- Flyrock is contained within a 10m buffer zone behind the last row of blastholes.
- Back break and block movement does not extend more than 10m behind the blast.
- Ground vibration can be controlled to a limit that will not damage or disturb the Aboriginal Heritage Sites to ensure their preservation and to result in a stable rock face at the extraction limit.

The processes involved in the management of the blasting process are specified in a separate Blast Management Plan (BMP) for the site. The BMP addresses the issues involved in managing a blast to achieve the required degree of control under the following chapter headings.

- Emergency procedures
- Applicable legislation and regulations
- Responsibilities
- Blasting process
- Risk assessment
- Records

Blasts conducted according to the Blast Management Plan will permit blasting to achieve the required control over the environmental impacts without causing damage or disturbance to Aboriginal Heritage Sites and conservation zones by vibration or impact from flyrock. With adequate blast practices, it was shown that a 10m buffer is sufficient to protect Aboriginal Heritage Sites and conservation zones from blasting impacts.

1 INTRODUCTION

The Nickol Bay Quarry is owned and operated by Holcim (Australia) Pty. Ltd. (Holcim), formerly known as CEMEX Australia Pty. Ltd. The rock quarried is defined as granodiorite.

Terrock Consulting Engineers were requested to prepare a Blasting Impact Assessment and a separate Blast Management Plan (BMP) for the Nickol Bay Quarry. The BMP is to include the results of the Blasting Impact Assessment of blasting in the quarry on Aboriginal Heritage Sites within and adjoining the planned eastern and western extensions to the quarry and the operational control necessary to protect the sites from blast related damage.

A plan of the Nickol Bay Quarry is shown as **Figure 1**, which shows the locations of the quarry extensions and conservation zones.

The blasting impacts considered to have a possible impact on the Aboriginal Heritage Sites and conservation zones are:

- Ground vibration
- Airblast
- Wall Stability
- Back break/overbreak
- Flyrock
- Dust

Airblast was not included in this assessment. The quarry is within an area subject to cyclones and the momentary change of pressure associated with air blast on the Aboriginal Heritage Sites and conservation zones is considered to be insignificant compared to cyclonic wind conditions.

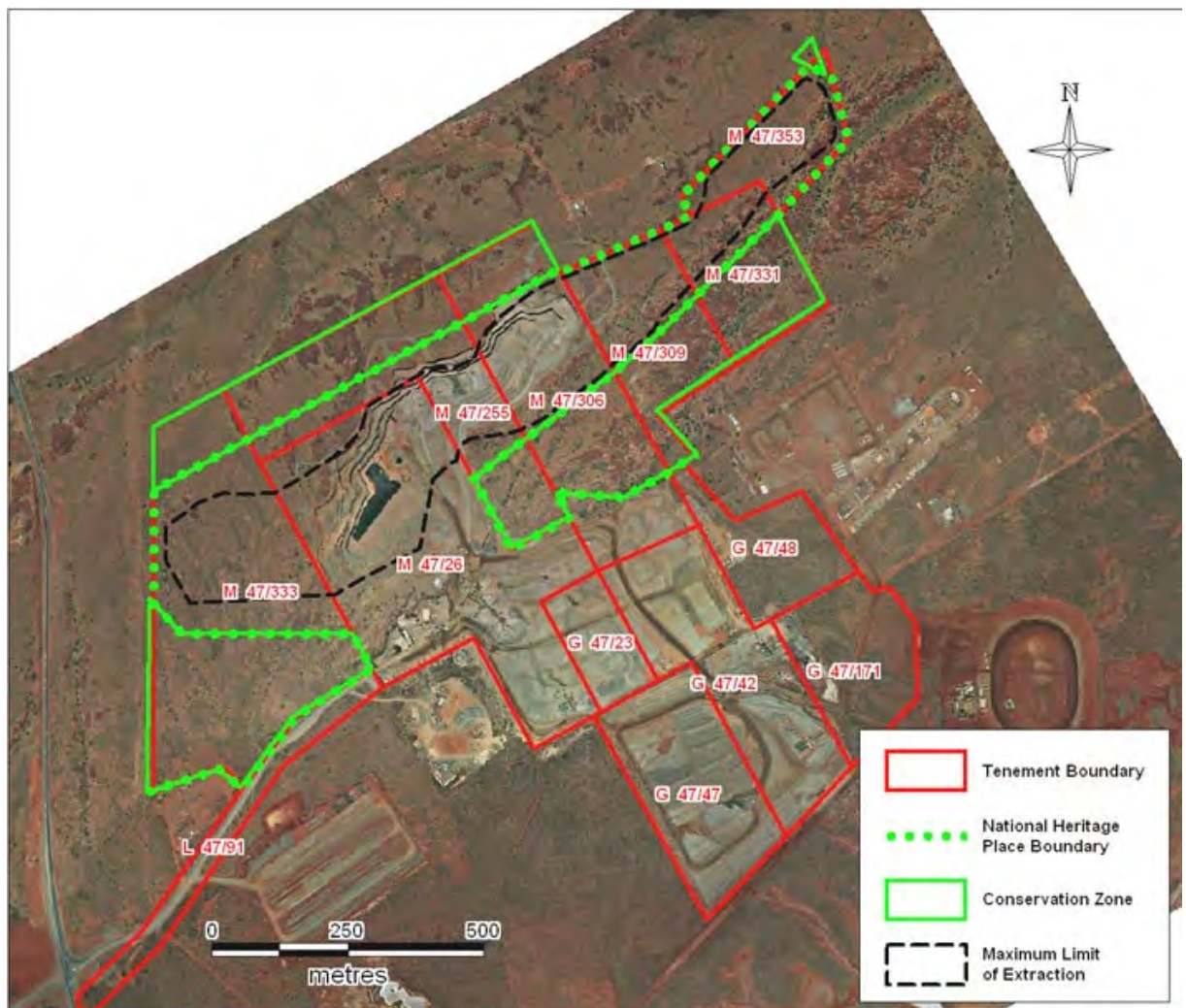


Figure 1 - Holcim Nickol Bay Quarry siteplan

Also, as it is generally accepted by dust control consultants that the dust from blasting is a minor contributor to the overall dust loading from quarry operations, the issue of dust from blasting was not addressed.

It is essential that the Aboriginal Heritage Sites are not damaged or disturbed by blasting activities and that flyrock from within the quarry does not project beyond the quarry boundary onto the adjoining conservation zones and/or known Aboriginal Heritage Sites.

For the benefit of people who are unfamiliar with blasting practice and vibration measurement, a section of explanatory notes has been included as **Attachment 1-Explanatory Notes**.

2 BLASTING OPERATIONS

The Nickol Bay Quarry is owned and operated by Holcim (Australia) Pty. Ltd. The blasting operations are managed by the Quarry Manager employed by Holcim, but certain blasting operations are conducted under contract by Maxam Australia Pty Ltd. Responsibility for the conduct of blasts can be summarised as follows:

Overall blast management	Quarry Manager
Face survey, hole layout and bore tracking	Maxam
Explosives supply and hole loading	Maxam
Blast loading and initiation design	Maxam
Blast vibration monitoring and recording	Maxam
Shotfirer	Maxam
Conduct of blasts	Maxam
Responsibility for regulatory compliance	Quarry Manager & Maxam

3 LEGISLATIVE FRAMEWORK

Blasting operations are a controlled process that is regulated by Commonwealth and State Legislation and industry standards and codes which are listed in detail in the Blast Management Plan (BMP). In addition, due to the nature of the operations and the presence of the Aboriginal Heritage Sites and conservation zones, quarry operations are subject to compliance with further Commonwealth and State Legislation, which are also listed in the BMP.

Under the various legislations, the responsibilities of the Quarry Owner, Quarry Manager and Shotfirer are clearly defined, together with those of blasting service providers and persons within a quarry. There are penalties specified in the legislation for breaches of the regulations at all levels.

In addition, quarry manager and shotfirers are required to hold statutory certificates and permits and these can be suspended or cancelled if the regulations are not obeyed.

4 GROUND VIBRATION ASSESSMENT

This assessment was prepared by the analysis of Maxam Drill and Blast Reports for 2009. Blasting practice has been improved considerably since January 2009 and these records reflect current practice. Maxam Australia provides a range of drill and blast, explosive supply, survey and vibration monitoring services for the quarry.

The blasting specifications data used in this assessment is summarised in **Appendix 1**. Quarry blasting is based on vertical holes of 102mm diameter. The distances quoted were determined from the monitor to the nearest point of the blast.

The data reveals that the minimum front row burden was 2.8m and varied up to 4.2m. The spacing varied from 3.2m to 5.0m. Stemming height varied from 3.5m to 5.0m. The blasts with larger spacings and reduced stemming were for blasts designed to produce armour rock. The blasts with reduced burdens and spacings were to improve fragmentation and muck pile shape for digging.

4.1 REGRESSION ANALYSIS

The ground vibration arriving at a location remote from a blast is a function of many factors, including;

- Charge mass of explosive fired in each hole
- Distance from the blast
- Explosives properties and coupling to the rock
- Ground transmission characteristics
- Geomechanical properties of the rock (which includes the origin)
- Presence of structures within the rock, such as bedding, faults and joints
- Degree and depth of weathering at the surface
- Soil profile
- Initiation sequence and direction of firing

Generally, all other factors being equal, the ground vibration increases with increasing charge mass and reduces with distance.

A regression analysis was conducted of the ground vibration measurements using a -1.6 exponent, as shown in **Figure 2**. The distances in the blast data range from 140m to 435m. The vibration from full face blasts (face heights 14.7 – 15.6m) and reduced face blasts (face heights 8.6 – 9.8m) are identified separately.

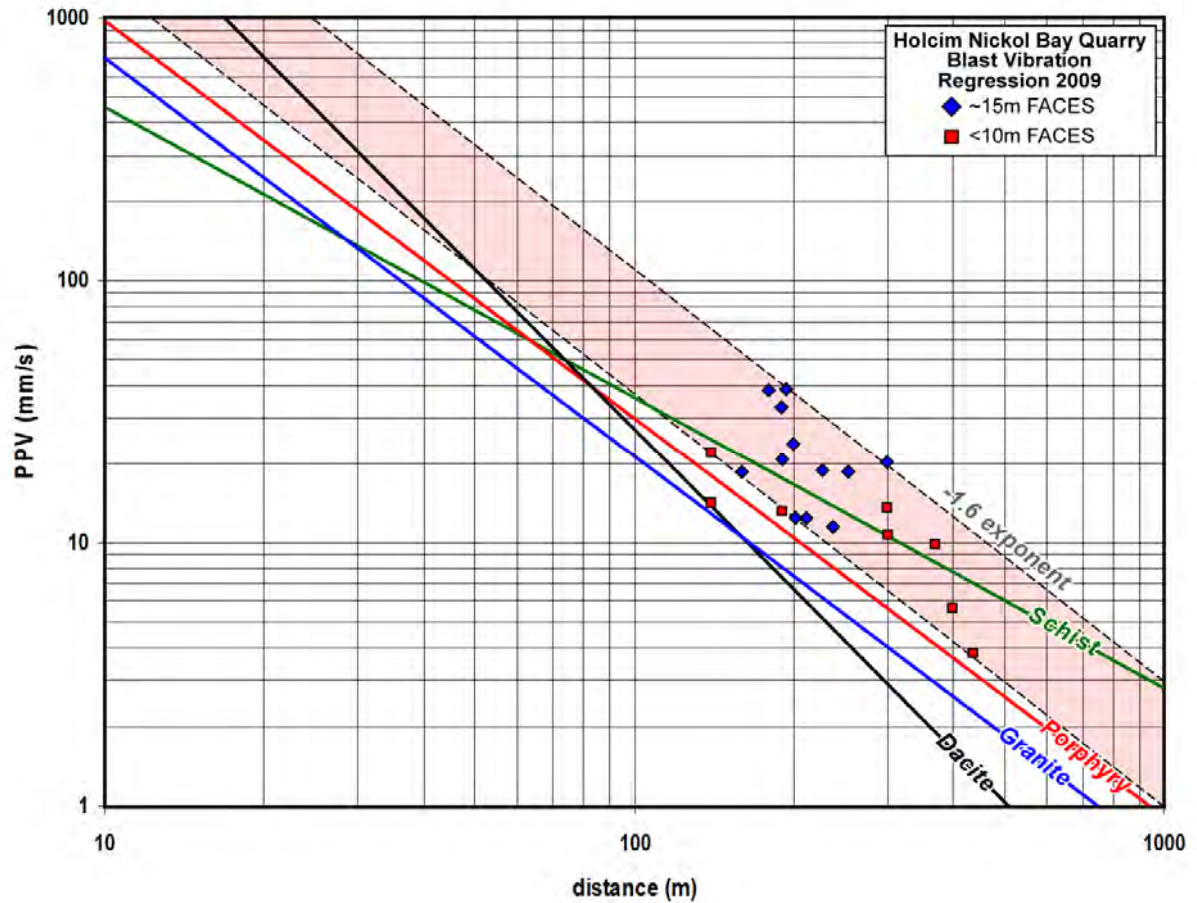


Figure 2 – Nickol Bay Quarry ground vibration regression analysis

4.2 SITE LAW ANALYSIS

The following Scaled Distance Site Law model was used to analyse the data:

$$PPV = k_v \left(\frac{\sqrt{m}}{D} \right)^{1.6} \quad [1]$$

Where PPV = Peak Particle Velocity (mm/s)

m = charge mass per hole (kg)

D = distance from blast (m)

k_v = Site Constant

Site exponent = 1.6

The determined Site Constant (k_v) are listed in **Appendix 1**. The Site Constant varied between 1200 and 4120 which reflects the variability of ground conditions between the blast and the monitors.

The worst case ground vibration levels can be predicted from:

$$PPV = 4120 \left(\frac{\sqrt{m}}{D} \right)^{1.6} \quad [2]$$

For a maximum charge of 127.2 kg (based on a 15.0m face, 10.6 kg/m, 1.0m subdrill and 4.0m stemming height) the maximum predicted PPV is shown as the top of the data envelope in **Figure 2**.

4.3 GROUND VIBRATION FROM CLOSE ORDER BLASTING

The vibration from close distance blasting (compared to distant blasting) is a special case because the length of a linear explosive column and the time for the explosive to be consumed are significant compared to the distance to a close reference point. The full charge mass does not contribute to the vibration. The work of Holmberg and Persson (1978) on Swedish granite determined that the contribution to vibration of incremental charges could be determined by integration to produce the curve shown as **Figure 3**. This figure is reproduced from *Hustrulid* (1999). The granodiorite at Nickol Bay is considered to have similar rock properties to the Swedish granite.

Figure 3 shows the relationship between PPV and charge mass at horizontal distances out to 50m for a 15.0m face blast. The regression line for 127kg, (102mm diameter, 15m face, 1.0m subdrill and 4.0m stemming height) using the curves of Holmberg for granite is shown in **Figure 2**. This approach assumes that the close distance relationship can be projected into the far field, which may not be the case.

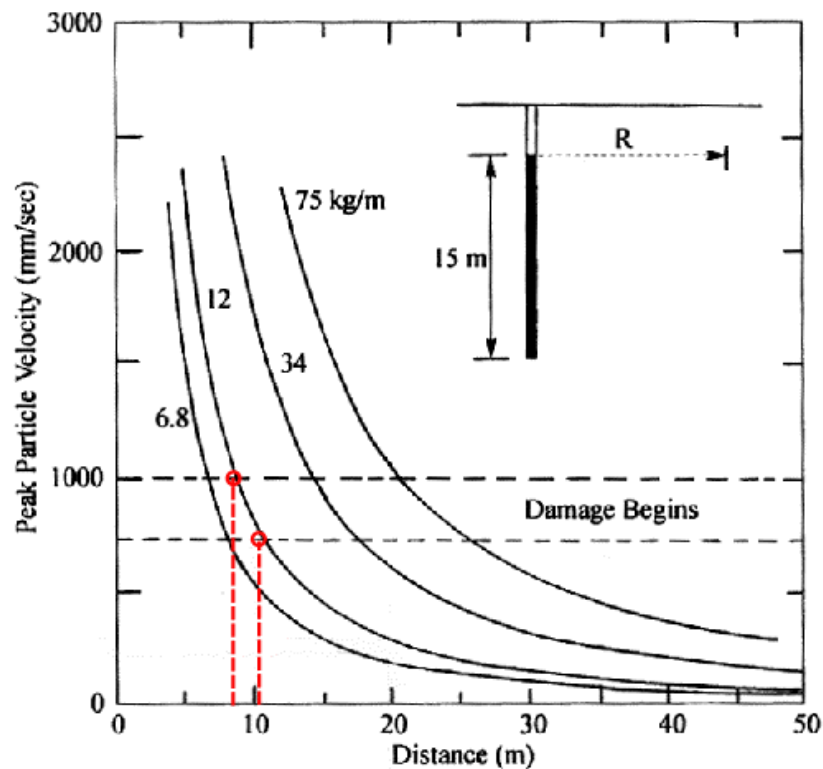


Figure 3 – PPV vs. distance curves with damage zone

The vibration from close order blasts was also investigated by Savely (1986) and is also reproduced in *Hustrulid* (1999). For three rock types in one mine described as Porphyry, Schist and Dacite, the following site laws were determined from regression analyses:

$$\text{Porphyry PPV} = 810 \left(\frac{\sqrt{m}}{D} \right)^{1.51} \quad [3]$$

$$\text{Schist PPV} = 398 \left(\frac{\sqrt{m}}{D} \right)^{1.10} \quad [4]$$

$$\text{Dacite PPV} = 2240 \left(\frac{\sqrt{m}}{D} \right)^{2.02} \quad [5]$$

The characteristics of the different rock types are described in **Table 1**.

Table 1 – Characteristics of Porphyry, Schist and Dacite (Savely, 1986)

Porphyry	<ul style="list-style-type: none"> - Hard, brittle and intensely fractured - Typically the blasted rock would have 80 percent of rock fragments less than 5cm (2 in.) size. The maximum size block would be about 30 to 60cm (1 to 2 ft) - Back break is controlled by joints and faults - In some areas the porphyry can be loaded by shovels without blasting but blasting makes loading more efficient
Schist	<ul style="list-style-type: none"> - Variable in hardness and fracture intensity - Most of the schist is foliated - The blasted rock tends to be more coarse than the porphyry. Typically 60 percent is more coarse than 5 cm (2 in.). The maximum size is about 120 cm (4 ft). - The schist seems to absorb energy but back break is often extensive. It follows major structure or foliation. - Is usually associated with the more sever slope instabilities.
Dacite	<ul style="list-style-type: none"> - Massive and competent. - Usually over 50 percent of the rock blocks are greater than 30 cm (1 ft) in diameter. Maximum size blocks are 300 cm (10 ft). - At hole spacings greater than 20 ft (6 m) large blocks will occur and secondary blasting is required.

A comparison of the rock descriptions given in **Table 1** indicates that Nickol Bay granodiorite is comparable to dacite. Regression curves for porphyry, schist and dacite are also shown in **Figure 2** for a 127kg charge mass.

The close order vibration predictions (<50m) from both Holmberg and Savely are lower than the measured vibrations at Nickol Bay, although the dacite predictions are trending towards the Nickol bay data projections. Further investigations are required to determine the close order relationship between charge mass, distance and burden.

4.4 VIDEO REPLAY ANALYSIS

The Nickol Bay blasts for 2009 were recorded on video and observations made of face movement, vertical lift, flyrock throw distances from stemming ejection, back break distances and rock fall from nearby faces. A summary of the observations of twenty blasts (20) is attached as **Appendix 2**. The results of a typical blast are demonstrated in the series of still images presented as **Figures 4a – 4f**. The following stills are from blast NB0919 fired on 22/07/2009.

The significant observations of these video stills are:

- Little or no back break
- No cracks behind the last row of holes
- No flyrock on bench behind the blast
- Loose rocks shaken and fall from the face behind at about 10m from blast
- Loose rocks on bench above are not disturbed



Figure 4a – Video frame: Pre blast



Figure 4b – Video frame: ~100ms



Figure 4c – Video frame: 1150ms



Figure 4d – 2550ms



Figure 4e – Video frame: 3750ms



Figure 4f – Video frame: Post blast

From **Appendix 2**, the observations were cross referenced to the specifications provided for each blast and the following conclusions were reached:

- Minor stemming ejection was observed when stemming heights of 3.5m and 4.0m were designed.
- The flyrock resulting from stemming ejection was essentially vertically and generally contained within the blast plan area.
- No flyrock was reported in front of blasts; the forward movement reported is normal face movement. The face movement distances reported correspond to 20m to 80m in front of the original face. These forward movement distances are consistent with the curve shown in **Figure 6** for an equivalent front row burden of 3.2m to 5.0m. This equivalent front row burden may be less than the designed burden of 4.0m. Not enough hole profiles are available to audit how rigidly the 4.0m design minimum is applied and what the minimum acceptable burden is.
- The maximum back break reported was 2.0 – 3.0m except for 4.0m recorded in blast 0917 in what is described as ‘broken ground’. In about two thirds of blasts no back break was reported.

Observations of video replays should continue, supplemented where necessary by field observations and GPS measurements of face movement, flyrock throw and back break.

5 ROCK DAMAGE AND WALL STABILITY

The investigation of Holmberg and Persson determined that a ‘safe’ vibration limit for hard Swedish granite was 700 – 1000mm/s. These limits are shown in **Figure 3**. For an explosive with a charge mass of 10.6kg in a 15m deep blast hole, the ‘safe’ limits would be reached at horizontal distances between 7 and 9m from the blast hole.

Savely also published the observational damage limit criteria produced in **Table 2**. To be conservative and using the dacite results as a guide, the “no damage” threshold is 635mm/s and the level at which loosened rock falls that would have remained in place without blasting extends to 1270mm/s. The distances at which these vibration levels would result from a blast of 127kg can

be determined from **Figures 5a**. The “no damage” threshold limit would occur at about 21.0m and the loosened rock damage limit extends to about 14.0m for full blasts. Minor damage would be expected at about 12.0m for reduced face heights or a charge mass of 52.0kg, the milestone distances are 140.m, 9.5m and 8.0m respectively.

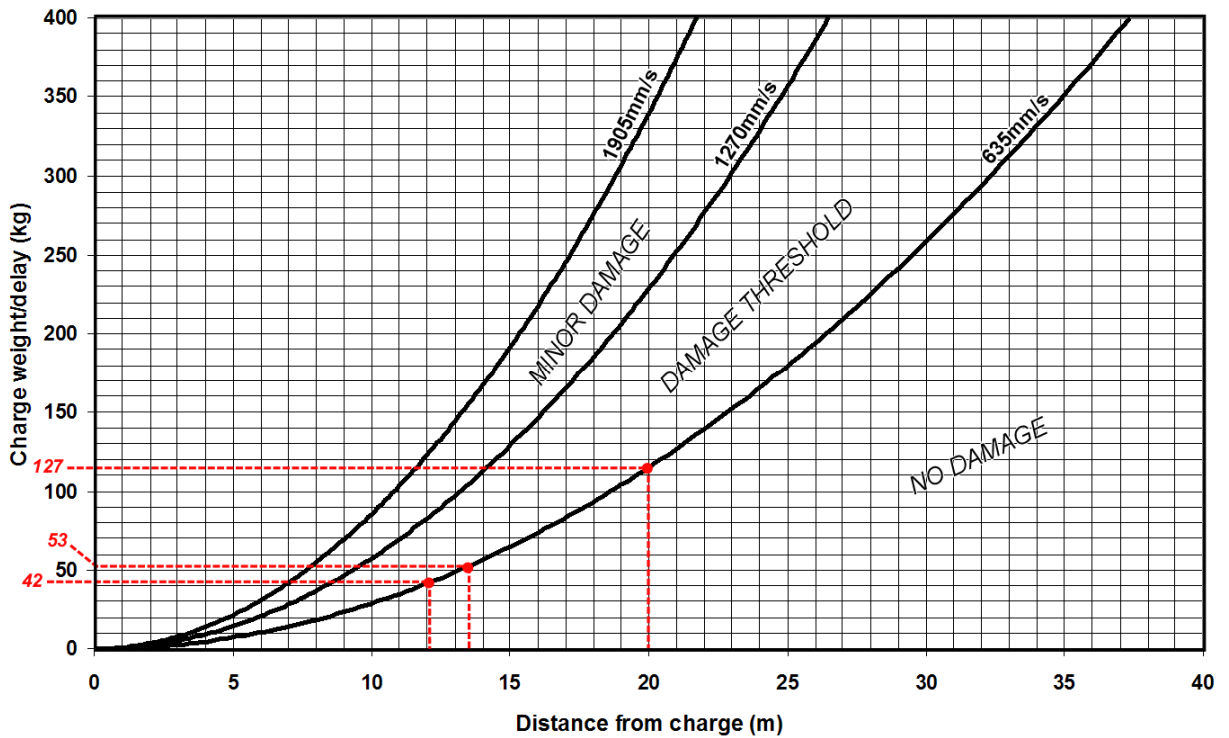


Figure 5a– Damage curves based upon dacite data (after Savely, 1986)

Table 2 – Observational blasting damage criterion (after Savely, 1986)

Observation	Conclusion	Limiting PPV (mm/s)		
		Porphyry	Schist	Dacite
Occasional falling of loose rocks from bench faces	No damage	127	51	635
Partially loosened rock falls from faces that would have remained in place if not blasted	Possible damage, but probably acceptable	381	254	1270
Portions of bench face fall, loosened rock falls, some fracture in bench level	Minor blast damage	635	381	1905
Back break extends into toe, future benched heavily fractured, noticeable increase in fracture intensity on bench and in face, loose rock blocks in face, cratering near bench toe, heaved ground and offset on structure	Blast damage	>635	>381	>1905

A similar curve to Savely’s (**Figure 5a**) was produced for the worst case Nickol Bay site law data and is shown in **Figure 5b**. This is not specific close order data for Nickol Bay but serves to demonstrate that for full face blasts (127kg), by Savely’s criteria, out to 24.0m loose rocks may fall as the result of blast vibrations that may not have fallen. For reduced face heights, the distance is reduced to 14.0m.

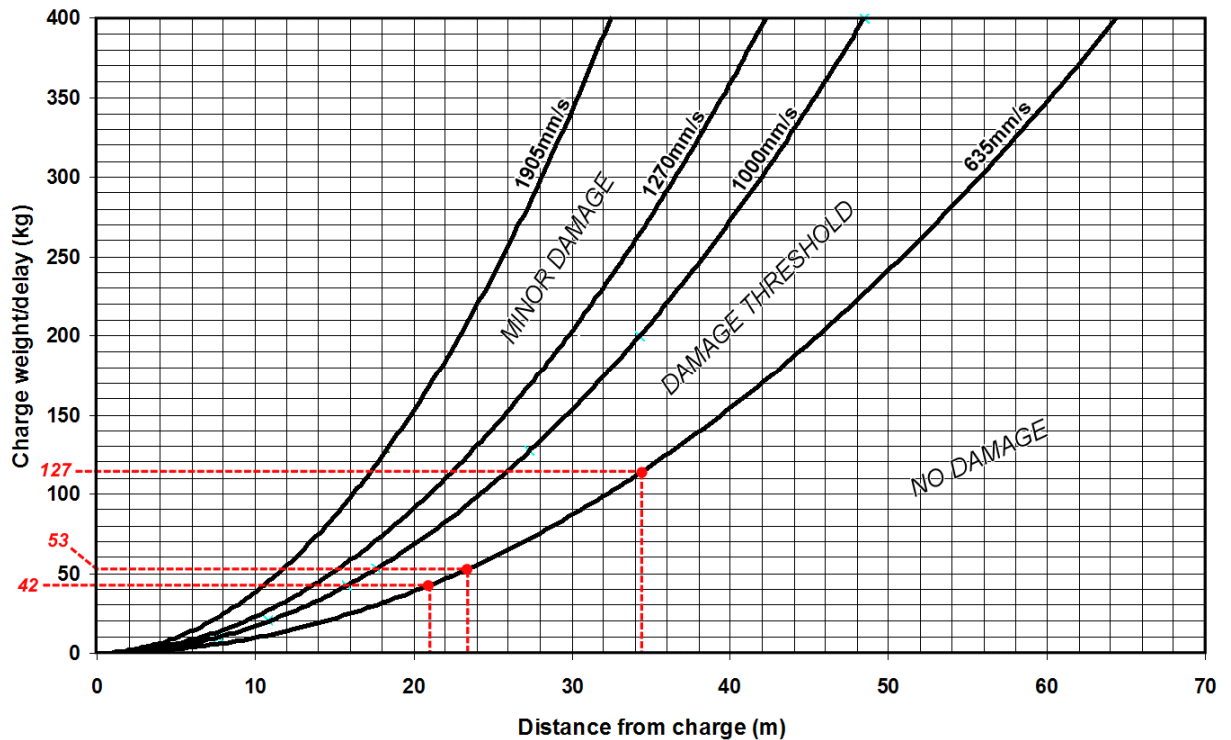


Figure 5b – Damage curves for Nickol Bay granodiorite (worst case)

The minor damage distance of Savely is of similar order of magnitude to the 7.0-9.0m determined from Holmberg and Persson. An inspection of videos of blasts at the Nickol Bay Quarry shows that while not precise, the distances at which rocks are shaken loose from faces near the blast are in the order of distances determined by the researchers.

A blast vibration monitoring program using multiple instruments placed in a radial line from blasts could be used to further refine the close field site law model at Nickol Bay. The dynamic range of the instruments is a limit to how close measurements can be taken. The program of video observation and recording of back break, rear flyrock and falling loose rocks should continue to confirm if a 10m buffer distance is appropriate for limiting minor rock damage as described by Savely.

The work of Holmberg and Persson suggests that full face blasting can be conducted at an extraction limit with a 10m buffer zone without damaging the rock at the boundary. The work of Savely and the worst case Nickol Bay prediction using the Savely damage criteria suggest that controlled perimeter blasting may be necessary to maintain a stable wall as blasts approach the extraction limit. The video observations suggest that the vibration levels at which loosened rock falls that may have remained in place is about 10m near a full 15m high face. A possible controlled perimeter blasting treatment to satisfy both the worst case vibration predictions and flyrock predictions is detailed in Chapter 7.

The observations in **Appendix 2** show that the maximum back break distance was 4m in broken ground and 2-3m behind the last row of blastholes. This suggests that the cracks in the benches due to block movement behind the blast can be controlled. From the evidence to date, from a ground vibration/rock damage perspective, it may be reasonably concluded that a 10m buffer zone between the extraction limit and the tenement boundary and Aboriginal Heritage Sites can be considered to be appropriate with proper management of the blasting process.

6 FLYROCK

Flyrock can be defined as any rock fragments that are thrown unpredictably from a blast, as distinct from the normal expected rock movement. Flyrock results from a lack of confinement of the gaseous energy released during an explosion, due to lack of burden, insufficient stemming or unsuitable stemming material.

The blast observations reported in **Appendix 2** shows that:

- Any flyrock in front of the face is contained within the normal forward movement of the rock mass. The maximum face movement reported is 80m.
- Flyrock associated with stemming ejection from main production blasts has little horizontal travel and is usually contained within the area of the blast plan.

The maximum distances that flyrock travels from particular confinement conditions have been quantified and models were developed by Terrock following investigations of many flyrock incidents. The flyrock direction depends on whether the least confinement of the explosion is from the burden or from the stemming.

In burden controlled conditions the potential for flyrock in front of a face in hard rock quarries is a function of the minimum burden conditions and the charge mass according to the model:

$$L = 74.4 \left(\frac{\sqrt{m}}{B} \right)^{2.6} \sin 2\phi \quad [6]$$

The maximum throw occurs when the launch angle approaches 45°

$$\text{i.e.} \quad L_{\max} = 74.4 \left(\frac{\sqrt{m}}{B} \right)^{2.6} \quad [7]$$

Where L_{\max} = maximum throw (m) to a point at the same elevation

m = charge mass per metre (kg)

B = minimum front row burden (m)

The maximum throw results from launching the rock at a 45° angle. For 102mm diameter blast holes with an explosive charge of 10.6kg/m and a minimum front row burden of 4.0m, the predicted flyrock throw is 44m. This is most likely to occur in a 90° arc centred perpendicularly to the face (see **Figure 6**). The effect that changes of burden have on the maximum throw is shown in **Figure 7**.

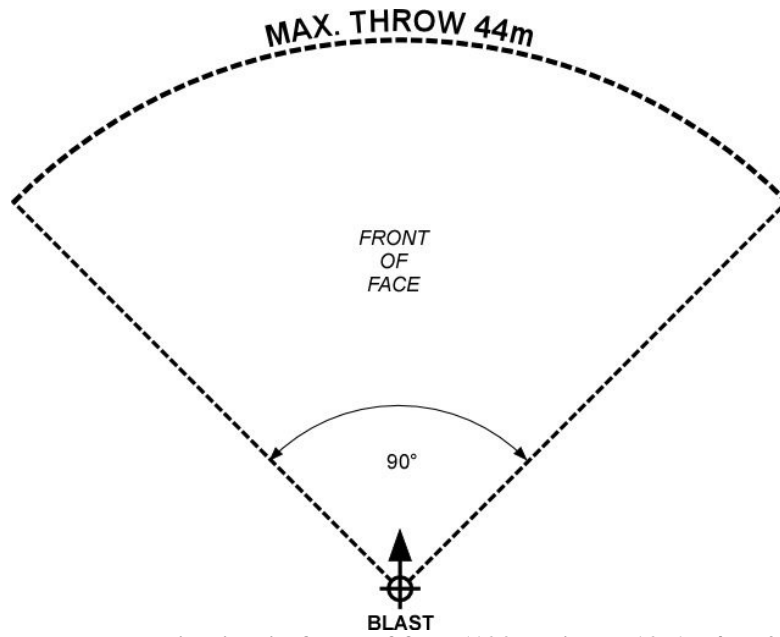


Figure 6 – Maximum throw projection in front of face (102m diam., 10.6kg/m, 4.0m burden)

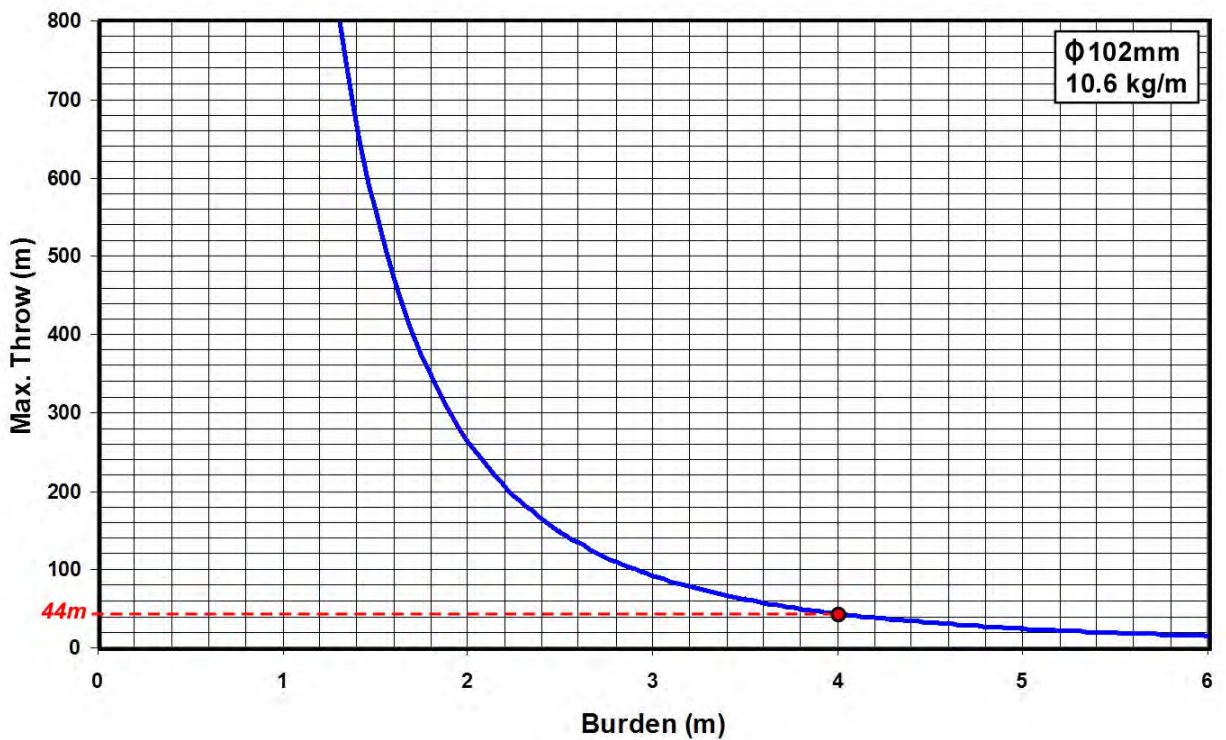


Figure 7 – Maximum throw vs. burden

If the front row burden is adequate, there are two remaining possibilities for flyrock:

- cratering
- stemming ejection (rifling, or gunbrelling)

Providing the stemming height is greater than about 10-15 hole diameters, cratering does not occur. The only potential for flyrock behind the face is from stemming ejection which may carry with it small stones from the hole walls and collar. The stemming ejection model is:

$$L_{\text{behind}} = 74.4 \left(\frac{\sqrt{m}}{S.H.} \right)^{2.6} \text{Sin} 2\phi \quad [8]$$

Where: S.H. = stemming height (m)

ϕ = launch angle

= hole angle – an allowance for dispersion at the hole collar

For the Nickol Bay Quarry, where the long stemming heights result in a strongly vertical emission, a 5° dispersal allowance is considered to be appropriate.

$$\therefore L_{\text{behind}} = 74.4 \left(\frac{\sqrt{10.6}}{S.H.} \right)^{2.6} \text{Sin} 170^\circ \quad [9]$$

For a 3.6m stemming height $L_{\text{behind}} = 10.0\text{m}$

For a vertical hole, if the stemming height is increased to 4.7m, flyrock from stemming ejection has the potential to land within a 5.0 metre radius as shown in **Figure 8**.

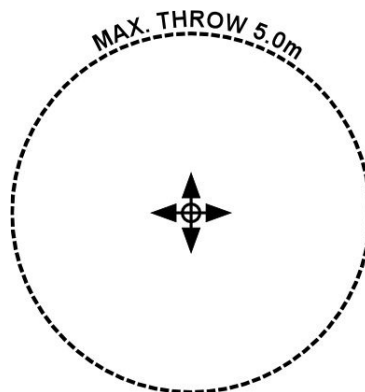


Figure 8 – Maximum throw projection, stemming ejection

The sensitivity of flyrock to changes of stemming height can be demonstrated in **Figure 9**.

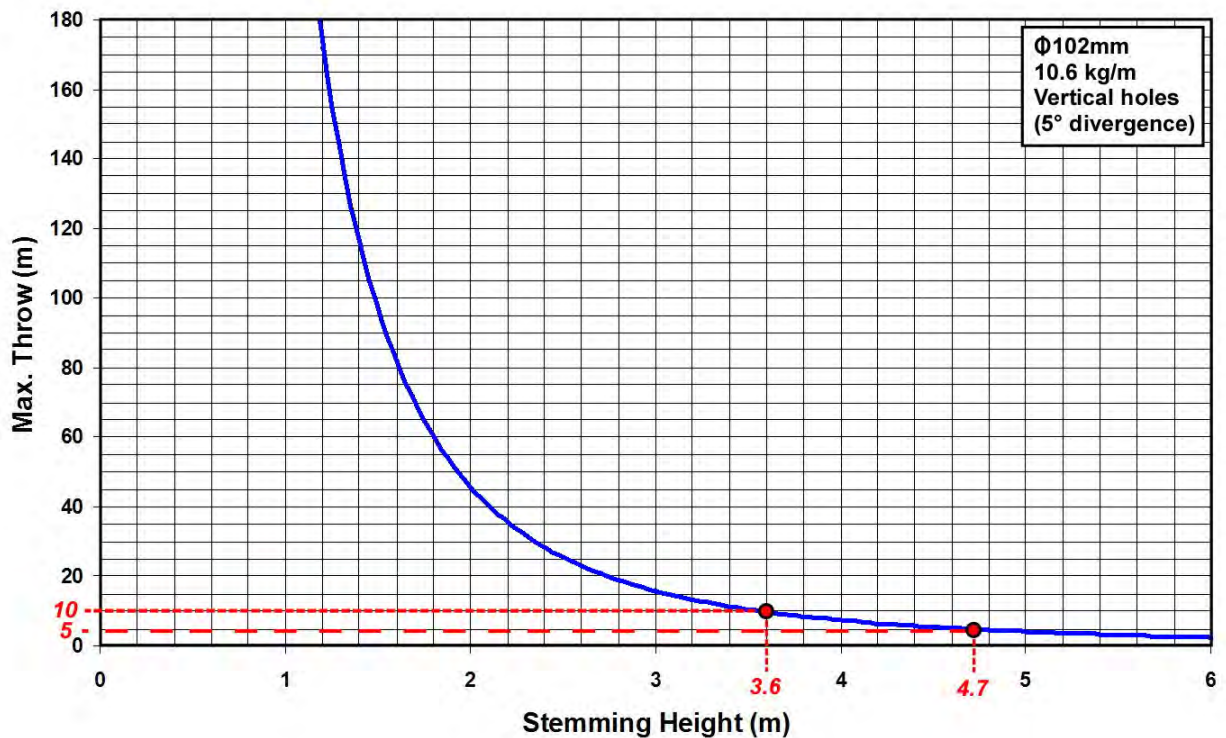


Figure 9- Maximum throw vs. stemming height – vertical holes

The maximum throw predictions from this model are consistent with the flyrock observations from stemming ejection. The flyrock observed from stemming ejection usually lands with the blast plan area. Stemming practice is to use 14mm aggregate as stemming material, which proves to be effective when ever used. The stemming lengths currently used of 3.5 – 5.0m appear to be adequate. The stemming height may need to be increased to 4.7m as blasting approaches the extraction limit near the conservation zones and Aboriginal Heritage Sites to limit the throw to 5.0m.

A program of flyrock observation and recording should continue at the quarry as a step in the blasting process to calibrate the flyrock model and validate the assumptions made in this report. On going review and modification of the model should be part of the Blast Management Plan.

The maximum height reached by stemming ejection can be predicted from:

$$H_{\max} = 37.2 \left(\frac{\sqrt{m}}{S.H} \right)^{2.6} \sin^2 \phi \quad [10]$$

Where: H_{\max} = maximum height (m)

S.H. = stemming height (m)

ϕ = launch angle

= hole angle – an allowance for dispersion at the hole collar (5°).

The maximum predicted heights reached by flyrock from stemming ejection for a stemming height of 4.0m in a vertical hole is 21.8m, which is comparable to the 20m high ejection observed and recorded from blast 0912. The trajectory for flyrock travel from stemming ejection can be predicted using the model described. The flyrock trajectories for a proposed perimeter control blasting are developed in the following chapter.

7 PERIMETER BLASTS

It is proposed to establish the ultimate faces at an extraction limit located 10m from the tenement boundary, the conservation zone and known Aboriginal Heritage Sites. To effectively establish stable ultimate walls in these locations and contain flyrock within the boundary (limiting the maximum throw to 10m behind the face), this investigation has established that careful perimeter blasting techniques may be required in the ultimate and penultimate blasts of the top bench. For the second and subsequent benches, there is not the same need to limit flyrock, but continuing the perimeter blasting technique will promote stable walls above the deeper benches. The need for perimeter control blasting techniques will be determining by ongoing observations of face stability.

The following perimeter control blasting practice is proposed, as shown in **Figure 10**:

- Top bench crest to crest slope of 1 vertical to minimum 1 horizontal.
- Subsequent crest to crest slope of 1 vertical to minimum 0.6 horizontal.
- Perimeter holes drilled at $\frac{1}{2}$ spacing angled at 80° and loaded with 5m of charge with an airdeck created by an air bag located at 4.0m below the collar.
- A short 'easer' hole 9m deep to reduce oversize at the crest.

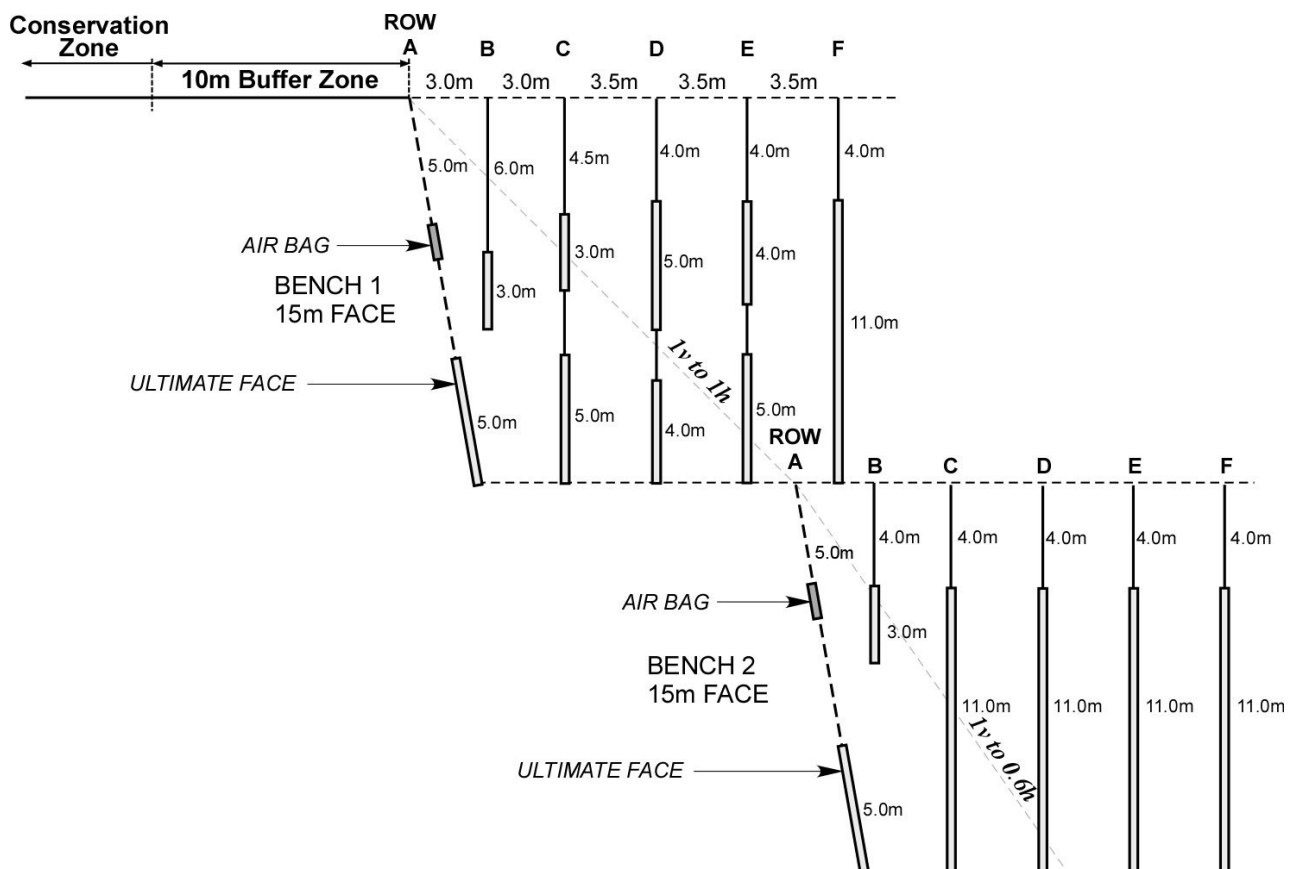


Figure 10 - Proposed perimeter control blasting practice, Nickol Bay Quarry

The loading specifications for the perimeter blasts are shown in **Table 4**. The peak PPV predicted at the extraction boundary using the worst case Nickol Bay site law for 1.3sg explosives is listed for Benches 1 & 2. The maximum flyrock throws, together with the flyrock travel heights are also shown in **Table 4**. The predicted PPV's at the boundary have been kept below 870mm/s at the boundary.

Full face blasts with a continuous charge column may be conducted to within 26.5m of the boundary on Bench 1 (Row F). A reduction in charge mass which is achieved by decking is then employed in closer rows of holes. In Bench 2 blasts, the full explosive column can be used in the Row C blastholes.

Table 4- Perimeter loading – 15m face (1.3 s.g explosives)

Bench 1 Row	Collar dist (m)	Stemming height (m)	Expl. Column (m)	Charge 1.3sg (kg)	Explosive dist. (m)	PPV (mm/s)	L _{rear} max	H max
A	10	5	4	42.4	18	810	8.3	11.8
B	13	6	3	31.8	15	861	2.6	7.5
C	16	4.5	5+3	53	21	752	5.5	15.9
D	19.5	4	3+5	53	23	650	7.5	21.5
E	23	4	5+3	53	26	534	7.5	21.5
F	26.5	4	11	116	28.5	868	7.5	21.5

Bench 2 Row	Collar dist (m)	Stemming height (m)	Expl. Collar (m)	Charge 1.3sg (kg)	Explosive dist. (m)	PPV (mm/s)	L _{rear} max	H max
A	26.5	5	4	42.4	37	250	8.3	11.8
B	29	5	4	42.4	32.5	315	4.2	12.0
C	31.5	4.5	11	116	37	571	7.5	21.5
D	35	4	11	116	40	505	7.5	21.5
E	38	4	11	116	44	433	7.5	21.5
F	41	4	11	116	48	377	7.5	21.5

The flyrock trajectories for the ultimate blasts are shown in **Figure 11**. The closest flyrock is predicted to approach the boundary is from holes in the A row holes. The predicted maximum throw for the A row holes is considered to be conservative because the reduced charge and air deck has not been calibrated into the model.

The trajectories for Bench 2 blasts are also shown. There is sufficient horizontal and vertical separation between the boundary and the blastholes for flyrock to be readily contained within the Bench 1 face.

Observations of the blast to date have shown that flyrock throw and wall behaviour may be conservative when compared to the model predictions. Observation should continue, especially of blasts along the top bench as they approach the extraction limit and a review of the models can be conducted when sufficient data is available.

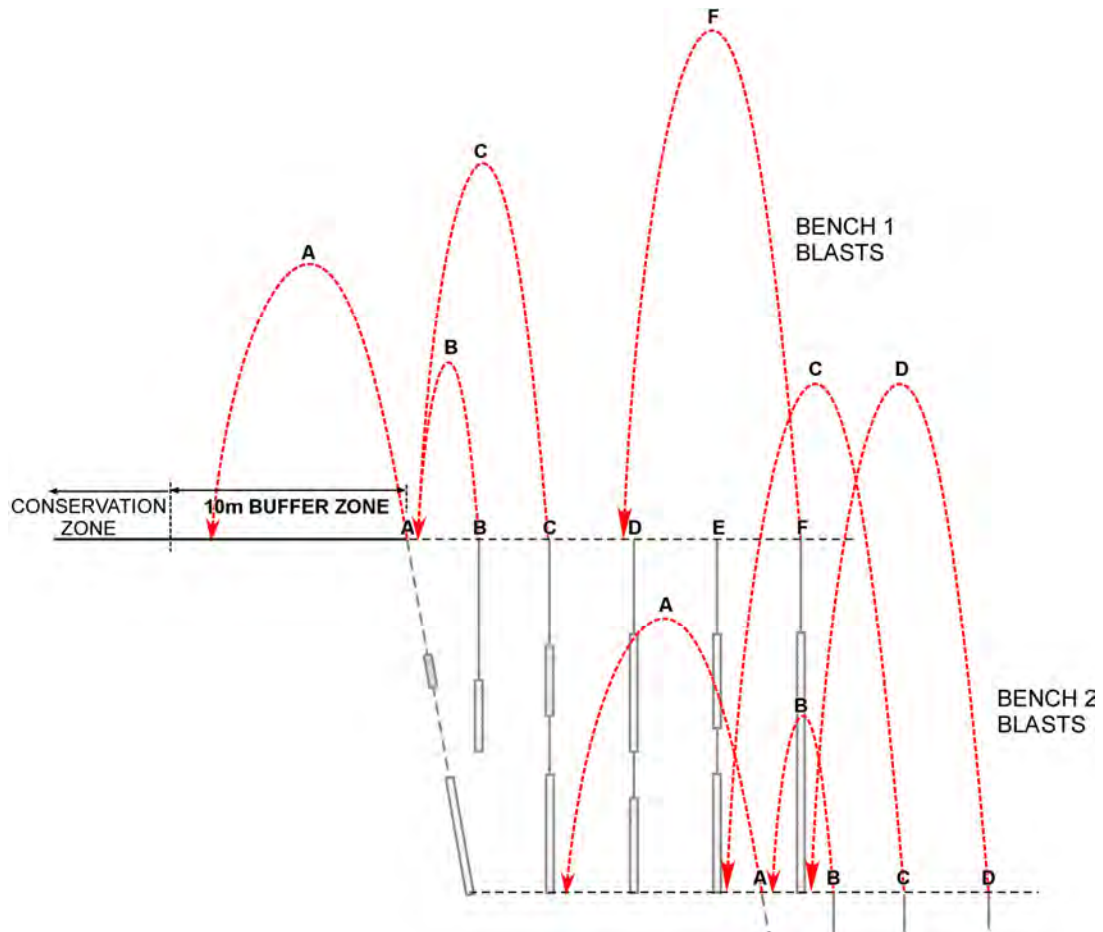


Figure 11 – Flyrock trajectories, Benches 1 & 2

8 ABORIGINAL HERITAGE SITES AND CONSERVATION ZONES

The Aboriginal Heritage Sites in close proximity to the proposed development areas are shown in **Figure 12** together with the conservation zones. The sites near the eastern and western extensions are briefly described in **Table 5**.

The Aboriginal Heritage Sites consist of eight (8) engravings, a grinding base, an exploited stone source, a pit and isolated artefacts and a small artefact scatter.

Most of the sites listed are not sensitive to blasting or ground vibration as such.

Table 5 - List of Aboriginal Heritage Sites at Nickol Bay Quarry

SITE ID	NAME	SITE TYPE
Eastern Extension		
26711	Cemex Quarry Complex	Engraving, Quarry, Artefacts/Scatter
26712	Cemex Engraving (CESLE001)	Engraving
26713	Cemex Pit (CESLP001)	Man-made structure, Artefacts/Scatter
Current Pit		
SA01	CEM-09-SA-01	Stone arrangement, Engraving
SA02	CEM-09-SA-02	Artefact/Scatter, Engraving, Grinding Platform
Western Extension		
20710	Nickol Bay Quarry (W1)	Man-made structure, Artefacts/Scatter, Quarry
20713	Nickol Bay Engravings (W5)	Engraving
20715	Nickol Bay Engravings (W7)	Engraving, Artefacts/Scatter, Midden/Scatter

Table 5 (continued)

20716	Nickol Bay Structure (W8)	Man-made Structure
20718	Nickol Bay Midden (W10)	Artefacts/Scatter, Midden/Scatter
24721	Readymix ECE001	Artefacts/Scatter
24723	Readymix ECE002	Engraving
24725	Readymix ECE003	Engraving
24726	Readymix ECE004	Engraving
24727	Readymix ECE005	Engraving
24728	Readymix ECE006	Engraving
ENG-01	CEM-09-ENG-01	Engravings
ENG-02	CEM-09-ENG-02	Engravings
ENG07	CEM-09-ENG-07	Engravings
GP01	CEM-09-GP-01	Not Available
GS01	CEM-09-GS-01	Not Available
SA03	CEM-09-SA-03	Not Available
SA04	CEM-09-SA-04	Pit
SC01	CEM-09-SC-01	Large-scale Site Complex
SC02	CEM-09-SC-02	Site Complex
QU-001	CEM-09-QU-001	Quarry, Artefact Scatter

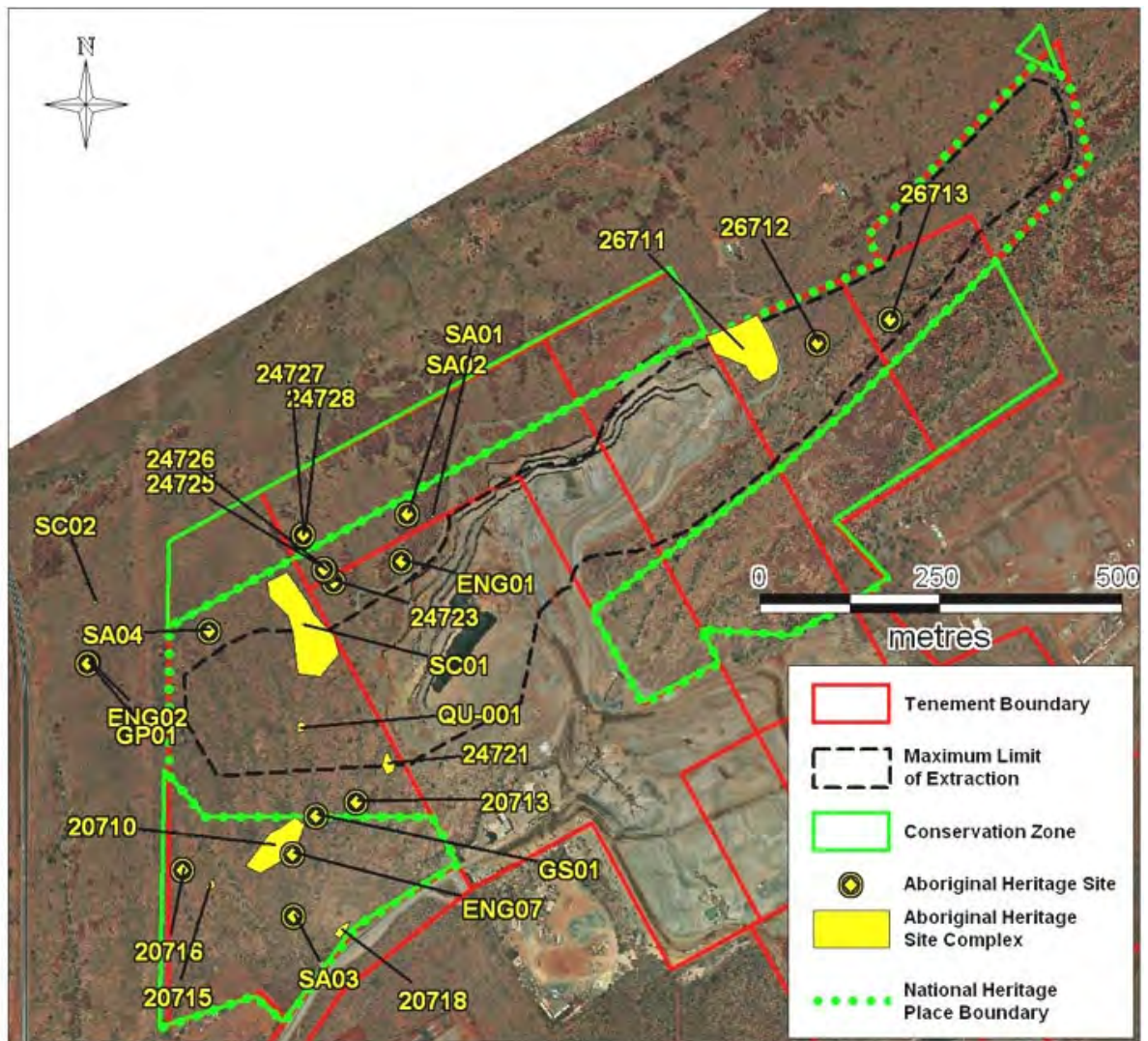


Figure 12 – Location of Aboriginal Heritage Sites

The engravings, grinding base and stone pit have been worked into discrete boulders, whose dimension are defined by weathered jointing planes. The boulders will not be broken by blasting or blast vibration. The only possible mechanism for the boulders to be effected by blasting is minor movement along the jointing planes that may freshen up existing cracks. This would only result from blasting at very close quarters within the block movement zone. Beyond the block movement zone, the ground motion is elastic and the surface returns to its original position.

The isolated artefacts (CESLP001, ECAS001) and exploited stone source (CESLESS001) consist of piles and scatterings of loose large flakes and cobbles, some of which are evidently rejected stones, that appear to have been placed by hand. The potential for these sites to be disturbed by blasting is considered to be:

- toppling or displacement of rocks from the piles
- permanent surface displacement along jointing planes in the ‘block movement zone’ from very close blasting
- impact of flyrock of sufficient size

The vibration levels at which rocks topple is a function of their shape, inertia, mechanical interlocking, friction and gravity. The 654mm/s limit from the work of Savely being the observational limit for the occasional falling of loose rocks benches may give an indication of the likely levels at which the rock piles may be disturbed. e.g. 21m for 127kg charge mass and 12m for 42m charge mass. This level of instability must be established by observation. The video evidence is that cracks do not extend more than 4.0m behind a blast.

To monitor the effect of vibration on loose rock piles, and incremental observational approach is recommended. A controlled photographic record should be taken of the sites. The record could consist of baseline photos to record the state of the site at a particular date, followed by photo’s taken at for example, six monthly intervals (or after significant weather events) when blasting is further than 100m away. As blasting moves closer, a video camera should record the response of the rock piles to vibration, the blast distance and the vibration level prediction at which the rocks begin to fall should be noted. Future blast design could then be based on a proposed 90% of this instability level to provide a safety factor. It may not be possible to measure the PPV level as such as it will probably exceed the dynamic range of the instruments.

This approach is considered to be reasonable since the rock piles are subject to natural forces such as earthquakes, cyclonic winds, torrential rain and hopping wildlife, all of which may cause loose rocks to topple or dislodge. The main issue with the conservation zone is the control of flyrock and preventing it being projected across the tenement boundary, this is discussed in Chapter 6 of this report.

The other main aspect to be considered for the preservation of Aboriginal Heritage Sites and the conservation zones is the stability of the ultimate pit wall at the extraction limit boundary. This issue is discussed in Chapter 7 of this report.

9 CONTROL OF BLASTING IMPACTS

A common method of controlling the impacts of blasting is to regulate the air blast and ground vibration by specifying a dBL or PPV limit at sensitive sites. If human response is not an issue, the limits may be increased to a 'safe' level that will not cause damage to a structure. In this Nickol Bay case, the 'structure' is the rock itself (or piles of loose rocks). Rock can be 'damaged' by very close blasting resulting in very high PPV levels. The indicated PPV levels at which granodiorite may be 'damaged' by block zone movement, indicated by back break, is probably in excess of 1000mm/s. A PPV limit is therefore not appropriate because of the limited dynamic range of commercially available monitoring instruments (~250mm/s) the PPV cannot be reliably measured.

However, ground vibration at close distances can be predicted from the interpolation of more distant measurements at an exponent or attenuation rate determined to be appropriate for the site. The ground vibration predictions can then be compared to the observed effects and a 'safe' level determined to be used as the basis for future ground vibration design.

At this site, the important blasting impacts to control are:

- no damage or disturbance to Aboriginal Heritage Sites by block movement or ground vibration.
- no damage or disturbance of the conservation zones.
- flyrock to be contained within the quarry property.
- stable faces at the ultimate walls at the extraction limits near the conservation zones and Aboriginal Heritage Sites.

Flyrock can be controlled by environmental blast design and blast management. The Blast Management Plan is a separate document. The steps in the blast design process are shown in the flow chart included as **Figure 13**. The other impacts can be controlled by an observational approach to determine appropriated blast designs, practices and techniques. The current program of observation, recording and continual review of the results should continue so they can be extrapolated and applied as blasting approaches the extraction limit.

The wall response and flyrock predictions made in this report are based on worst case assumptions from currently available data. If, in the event that it is required to reduce the effects of blasting on the ultimate faces, a number of techniques can be readily applied. The techniques include:

- use a lower s.g. explosive for first bench blasts to reduce the charge mass e.g. 1.3 s.g HANFO has a charge mass/ metre of 10.6kg. 1.1 s.g. HANFO has a charge mass/m 9.0kg/m and ANFO 6.5kg/m.
- Use 89mm blast holes for the ultimate blasts
- Use more closely spaced pre-split holes at the extraction limit rather than the half split approach suggested.
- Reduce the charge mass by reducing the length of the explosive decks.

The effect that the use of 1.1s.g. explosives has on the flyrock distances is shown in **Table 6**.

Table 6- Perimeter loading – 15m face (1.1s.g. explosives)

Bench 1 Row	Charge 1.1sg (kg)	PPV (mm/s)	L_{rear} max	H max
A	36	706	6.7	9.1
B	27	755	2.1	6.0
C	45	660	4.5	12.9
D	45	570	6.0	17.3
E	45	469	6.0	17.3
F	99	760	6.0	17.3

The top bench in some areas may consist of individual boulders whose shapes are defined by weathering along jointing planes. Such a situation may not lend itself to conventional perimeter blasting as outlined. To establish a stable crest may require a final trim by the excavator working on top of the muck pile. On site experience will determine what methods are best suited to the formation a stable crest and the need to pull down overhangs and loose boulders. The perimeter blast method described (or similar) may be used on deeper benches to establish stable walls.

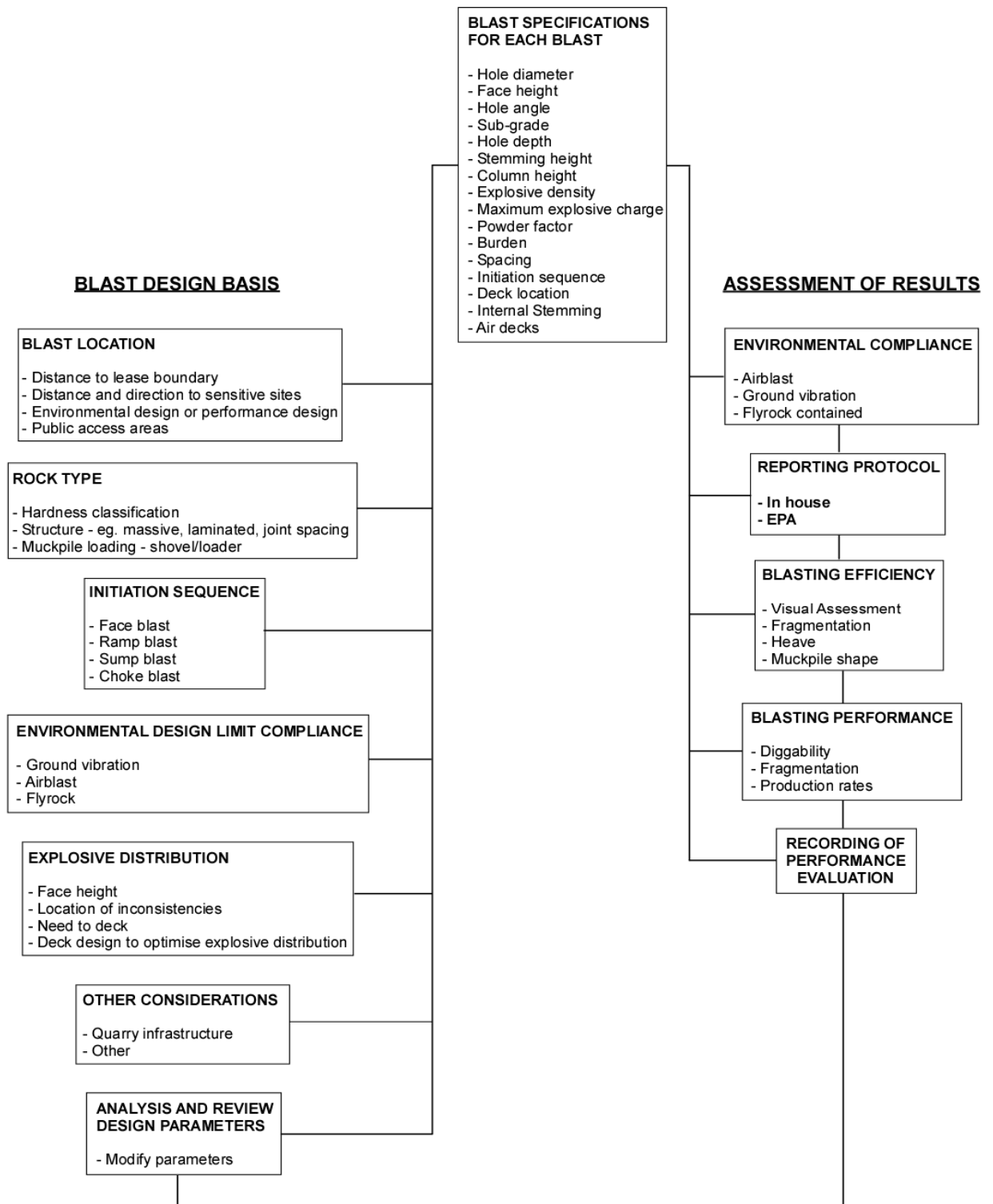


Figure 13 – Blast Design Flowchart

10 CONCLUSIONS

1. The outcomes of blasting are a function of blast design and the conscientious implementation of the design by the driller, shotfirer and persons loading and firing the blast.
2. With correct environmental design and well managed drilling and blasting practices, as proposed in the BMP, blasting operations can be conducted in the Nickol Bay Quarry without damage or disturbance to the nearby Aboriginal Heritage Sites and conservation zones, to ensure their preservation.
3. This investigation has shown that a 10m buffer zone provides adequate protection for Aboriginal Heritage Sites and the conservation zones with a defineable safety margin for flyrock and back break.
4. The investigation has shown that perimeter control blasting techniques may be required to form stable faces as blasting approaches the extraction limit. Perimeter control blasting as proposed uses reduced charge mass and other techniques to:
 - Lower ground vibration in the buffer zone and beyond the tenement boundary
 - Improve stability of the ultimate quarry wall
 - Reduce back break
 - Reduce the throw of flyrock from stemming ejection

Some experimentation may be required to determine the most effective control techniques, but indications are that full face blasting can be conducted to within 18.5m of the extraction limit before perimeter control blasting is required. The perimeter control blasting may only be necessary for the top bench to limit ground vibration beyond the tenement boundary.

5. To limit the possibility of damage to the Aboriginal Heritage Sites, blasts should face away from the sites, unless the front row burden is designed to limit the throw to half the separation distance. The configuration of the pit and its logical development suggest that few blasts will be fired towards an Aboriginal Heritage Site.
6. As the quarry deepens, the potential for flyrock damage is reduced because the maximum height reached by the flyrock is less than the bench height. The ground vibration levels beyond the tenement boundary also reduces as the distance to the blasts increases because the wall slope.

11 RECOMMENDATIONS

The recommendations from this report can be summarised as:

1. Blasts are conducted according to the Blast Management Plan.
2. The Blast Management Plan is reviewed and updated annually.
3. Continuation of the current systems of record keeping and observations that includes:
 - Blast report
 - Hole layout plan
 - Hole depths
 - Initiation sequence and tie up
 - Risk assessment
 - Hole profiles
 - Vibration monitor wave traces
 - Video recording of blast
 - Blast performance observation
 - face movement
 - back break
 - stemming ejection
 - flyrock throw
 - fragmentation
 - wall stability
4. Develop a spreadsheet program to continually update the Site Law, face stability and flyrock models. Use updated parameters in Environmental Blast Design. Develop close distance Site Law model for ground vibration limit design of blasts approaching the extraction limit near conservation zones and Aboriginal Heritage Sites.
The spreadsheet need only be a simple Excel spreadsheet that can be developed by someone with fairly basic computer and mathematical skills. A more robust database program will required more specialised programming skills.
5. Monitor the effects of blasting on sites with piles of loose rocks by a program of controlled photography and video records consisting of:
 - Baseline condition photos.
 - Periodic time review photos, say at six monthly intervals and after cyclones.
 - As blasting approaches within 100m of the Aboriginal Heritage Sites, video recording to establish vibration levels at which they become unstable. The 'instability' level (with a safety factor) then becomes the basis for environmental (PPV limit) blast design.



Adrian Moore
28th January 2010

APPENDICES

Table 1 – Summary of blasting specification from Maxam Drill Blast Reports 19/01/09 – 22/09/09

	Mid bench P. 19.01.09	Top Bench P. 26.02.09	Mid bench P. 27.02.09	Mid bench P. 18.03.09	Mid bench P. 11.04.09
Blast No.	#48	0907	0906	0909	0911
Front row burden (m)	3.2	4.2	4.0	4.0	4.2
Spacing (m)	4.0	5.0	5.0	5.0	5.0
Bench ht. (m)	15.7	14.7	15.6	14.9	14.8
Sub drill (m)	1.0	1.5	1.0	1.5	1.5
Stem ht. (m)	3.5	5.0	5.0	4.5	4.5
Avg. MIC (kg)	130	115.3	98.7	171	113.6
PPV (mm/s)	18.7	23.9	11.5	18.9	12.4
Distance (m)	254	200	238	228	212
Site Constant (K _v)	2681	2573	1855	1831	1483

	Top Bench Prod.		Mid Bench Prod.			Drop Cut Prod.	Midbenc h Prod.
	07.05.09	29.05.09	10.06.09	19.06.09	27.06.09		
Blast No.	0912	0913	0914	0915	0916	0917	0918
Front row burden (m)	4.0	4.2	4.0	4.0	4.0	3.2	3.5
Spacing (m)	4.0	4.0	3.6	4.0	4.0	3.6	4.0
Bench ht. (m)	15.1	15.4	15.1	14.8	15.1	8.6	15.2
Sub drill (m)	1.0	1.0	1.0	1.5	1.0	1.0	1.0
Stem. ht. (m)	3.5	4.0	4.5	4.5	4.5	4.0	4.5
Avg.chrg.mass(kg)	132.2	117.1	130.8	127.9	125.7	57.3	119.6
PPV (mm/s)	38.8	38.1	12.4	33.1	18.6	5.6	20.6
Distance* (m)	195	180	202	190	160	400	300
Site Constant (k _v)	3596	3423	1226	3022	1301	3198	4121
PPV (mm/s)							
Distance (m)							
Site Constant							
PPV (mm/s)							
Distance (m)							
Site Constant							
	Midbenc Prod.	RL25 Prod.	RL40 Prod.	RL25 Prod.	RL25 Prod.		
	22.07.09	31.07.09	07.08.09	12.08.09	22.09.09		
Blast No.	0919	0920	0922	0923	0927		
Front row burden (m)	3.5	2.8	3.2	2.8	2.8		
Spacing (m)	4.0	3.6	3.6	3.6	3.2		
Bench ht. (m)	15.1	9.8	14.7	8.8	8.8		
Sub drill (m)	1.0	1.0	1.0	1.0	1.0		
Stem. ht. (m)	4.5	4	4	4.5	4.0		
Avg.chrg.mass(kg)	130	73.3	112.7	59.7	61.2		
PPV (mm/s)		13.6	20.7	3.8	22.0		
Distance* (m)		300	190	435	140		
Site Constant (k _v)		4025	2091	2402	2222		
PPV (mm/s)				10.7	13.0		
Distance (m)				300	190		
Site Constant				3732	2140		
PPV (mm/s)				9.8	13.9		
Distance (m)				330	140		
Site Constant				3965	3261		

Video Analysis of Blasts at Nickol Bay 15/12/2008 - 18/12/2009

Shot ID	Date Fired	Level	Vertical Lift	Face Movement	Stemming Ejection	Flyrock Distance	New Back Wall	Comments
0847	15/12/2008	3	2-3m	RM side excellent. LM side less movement	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 10m above original crest level	Unknown	Muckpile OK no OS of significance
0901	28/01/2009	3	8m	All Face moves forward well	Nil	Nil back and sides. Rock goes forward from face 50m but no higher than 8m above original crest level	Muckpile on back wall in parts	Muckpile OK no OS of significance.
0902	31/01/2009	3	5m	All Face moves forward well. Trench at Base	Nil from main shot. 30m from OS boulders	Nil back and sides. Rock goes forward from face 50m but no higher than 5m above original crest level. Boulders on side go straight up and down 30+ m.	Muckpile away from wall. Wall looks good in video	Muckpile material OK. Boulders broken.
0903	7/02/2009	5	1m	Minimal	Nil	Nil	N/A	Great Wall shot. Disrupted the material but no movement and no ejection of any material.
0906	27/02/2009	4	2m	Minimal	Nil	Nil Back And Sides. Forward minimal due to Pattern	Minimal movement	No movement Large Rock Shot
0907	26/02/2009	3	1m	Minimal	Nil	Nil Back And Sides. Forward minimal due to Pattern	Minimal movement	No movement Large Rock Shot
0908	14/03/2009	3	1m	Minimal	Nil from main shot (one minor puff of 5m). 80m from OS boulders	Nil back and sides. Rock goes forward from face 20m and no higher than 1m above original crest level. Boulders on side go straight up or into pit. No Flyrock left Excavation lease.	Muckpile away from wall. Wall looks good in video	Muckpile material OK. Boulders broken. Too little burden for charge in boulders
0909	18/03/2009	3	2m	Minor 30m	Nil	Nil Back And Sides. Forward minimal due to Pattern	Minimal movement	Minimal movement, Trim Blast
0910	6/04/2009	4	4m	Minimal	Nil	Nil. Small section to 6m high directly about blast only.	Minimal movement	Minimal movement
0911	11/04/2009	4	1m	Minor 40m	Nil	Nil. Small section to 3m high directly about blast only.	Minimal movement	Minimal movement
0912	7/05/2009	3	6m	Moderate 80m forward	Minor but did not leave blast plan area.	Nil back and sides. Rock goes forward from face 80m. Rock goes 20m up and back into blast area. Boulders on side go straight up or into pit. No Flyrock left.	Exposed wall is OK. Backbreak 2-3m	Muckpile material OK. Boulders broken. Too little burden for charge in boulders
0913	29/05/2009	3	4m	Minor 40m	Minor but did not leave blast plan area.	Nil Back And Sides. Forward minimal due to Pattern	Exposed wall is OK. Backbreak 2-3m	Muckpile OK. OS on Eastern side.
0914	10/06/2009	4	Generally 3m, more in tight corner, 8-10m.	Moderate 80m forward	Minor but did not leave blast plan area.	Nil back and sides. Rock goes forward from face 80m. Rock goes 15m up and back into blast area.	Exposed wall is OK. Some overhang evident.	Muckpile OK. OS in middle.

0915	19/06/2009	4	6m	All Face moves forward well	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 3m above original crest level	Muckpile on back wall in parts	Muckpile OK. OS on surface.
0916	27/06/2009	4	6m	All Face moves forward well	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 3m above original crest level	Muckpile on back wall in parts	Muckpile OK. OS on surface.
0917	8/07/2009	5	4m. More in West to 10m	Minor 40m	Minor but did not leave blast plan area.	Minor back and sides. Rock goes forward from face 40m. Rock goes 15m up and back into blast area.	Muckpile on back Wall. Backbreak 4m. Broken ground	Muckpile is course. OS evident.
0918	13/07/2009	4	3m	All Face moves forward well	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 3m above original crest level	Exposed wall is OK. Backbreak 2-3m	Muckpile OK. OS on surface.
0919	22/07/2009	4	3m	All Face moves forward well	Nil. Minor puff in back corner no greater than 10m high.	Nil back and sides. Rock goes forward from face 80m but no higher than 3m above original crest level	Exposed wall is OK. Backbreak 2-3m	Muckpile OK. OS on surface.
0920	31/07/2009	5	5m	All Face moves forward well	Nil	Nil back and sides. Rock goes forward from face 60m but no higher than 3m above original crest level	Exposed wall is OK. Backbreak 2-3m	Muckpile OK. OS on surface.
0921	31/07/2009	4	N/A	Nil	Nil outside Blast Area	5m within blast Area only	N/A	Toe Blast No movement
0922	7/08/2009	4	<2m	All Face moves forward well	Nil	Nil back and sides. Rock goes forward from face 60m but no higher than 1m above original crest level	Exposed wall is OK. Backbreak 2-3m	Muckpile OK. Small amount of OS on surface
0923	12/08/2009	5	2m	Face moves 40m	Nil	Nil back and sides. Rock goes forward from face 40m but no higher than 1m above original crest level	Muckpile on back Wall. Backbreak minimal but some in Broken ground	Muckpile OK. Small amount of OS on surface
0924	20/08/2009	3	2m	Face Moves 80m over edge level below	Nil	Rock goes forward from face 80m but no higher than 2m above original crest level. Nil Top, back or sides	Exposed wall is OK. Backbreak minimal barrels in wall	Muckpile OK. Small amount of OS on surface
0925	31/08/2009	5	4m	Face moves 50m	Nil	Rock goes forward from face 50m but no higher than 4m above original crest level. Nil top, back or sides.	Exposed wall is OK. Backbreak minimal	Muckpile OK. Small amount of OS from front face only
0926	16/09/2009	4	6m	Face moves forward 60m. Centre crest area moves up more than usual but no flyrock etc	Nil	Rock goes forward from face 60m but no higher than 6m above original crest level. Nil top, back or sides.	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface
0927	22/09/2009	5	6m	Face moves forward 60m	Nil	Rock goes forward from face 60m but no higher than 6m above original crest level. Nil top, back or sides.	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface
0928	1/10/2009	5	6m	Face moves forward 80m	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 8m above original crest level. Minor puffing of top on back row	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface

0929	15/10/2009	5	4m	Face moves forward 80m	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 4m above original crest level	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface
0930	26/10/2009	5	4m	Face moves forward 80m	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 4m above original crest level	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface
0931	5/11/2009	5	4m	Face moves forward 80m	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 4m above original crest level	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface
0932	10/11/2009	5	6m	Face moves forward 80m. Face on South Side moves faster but no ejection	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 6m above original crest level	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on surface
0933	18/11/2009	5	2m	Face moves forward 80m.	Nil	Nil back and sides. Rock goes forward from face 80m but no higher than 2m above original crest level	Exposed wall is OK. Backbreak Minimal	Muckpile OK
0934	25/11/2009	5	4m	Face moves forward 60m.	Minor puff of duct, no rock. Looks like redrill hole or exproation hole venting	Nil back and sides. Rock goes forward from face 60m but no higher than 6m above original crest level	Exposed wall is OK. Backbreak Minimal	Muckpile OK. Small amount of OS on top
0935	18/12/2009	2	1m	Face moves forward 20m.	Nil.	Nil back and sides. Rock goes forward from face 20m but no higher than 1m above original crest level. Confined with loose material on front face.	Not exposed. Some backbreak evident but will evaluate after excavation. Expected to be less than 3m from design crest. In broken material logged from drilling.	Muckpile OK and as expected.

HOLCIM (AUSTRALIA) PTY LTD**NICKOL BAY QUARRY
BLASTING IMPACT ASSESSMENT****ATTACHMENT 1 – EXPLANATORY NOTES****A1.1 QUARRY BLASTING PRACTICE**

This section has been included to provide a basic explanation of quarry blasting practice for those who are unfamiliar with the subject.

Blasting is an important process in hard rock quarrying because it fragments and separates rock pieces from the rock mass, which enables it to be loaded and carted to the crusher for size reduction and screening to a range of commercial product sizes.

Blastholes are drilled downwards into the rock. A quantity of explosives is then placed in each blasthole, which is then topped up with crushed aggregate to effectively confine the explosives charge. Blasting practice at a quarry is described below:

89 or 102mm diameter blastholes are drilled a ‘burden’ distance from the edge of the quarry bench and between rows of holes. Blastholes are drilled at a ‘spacing’ distance apart, as shown in **Figure A1.1**. Holes are drilled with 0.5 – 1.0 metres of sub-drill to assist in maintaining the floor level. The hole length drilled is the face height, with an allowance for the hole angle and the sub drill length.

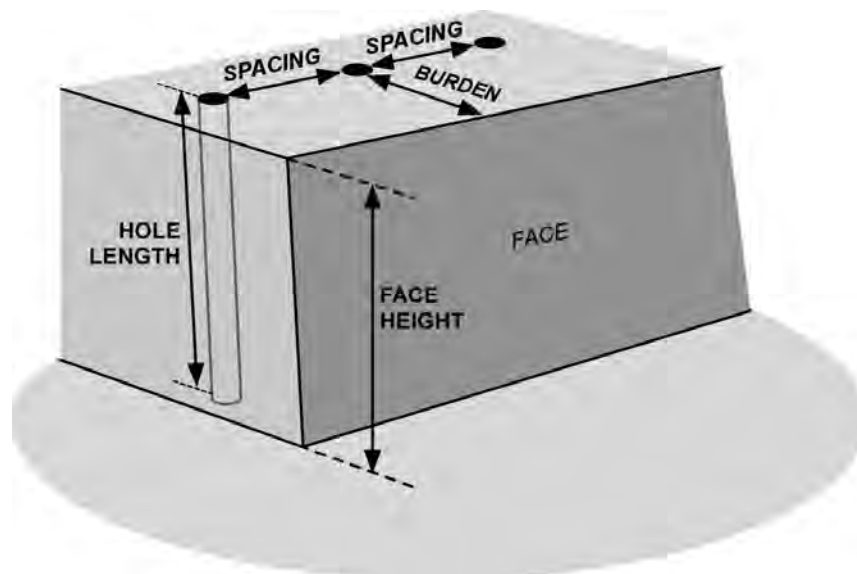


Figure A1.1 - Blasthole design for a typical quarry.

The burden and spacing are varied to match the characteristics of the rock being blasted. The actual face height may also vary to suit the depth of the rock to be excavated to establish and maintain level benches. The burden of the front row of holes may need to be increased to control airblast.

A ‘primer’ (is a small quantity of high strength explosive containing a down hole signal tube delay detonator) is lowered to the bottom of the blasthole by the signal tube lead. Explosives are then loaded into the blasthole until the top of the explosive charge is no closer than the stemming height from the collar of the blasthole. A common practise is to have the stemming height equal to the burden to control airblast.

The weight of explosives in the blasthole depends on the density of the explosive used. ANFO explosive when used has a density of 0.8g/cc. Bulk Pumpable Explosives have a density ranging from 1.1 to 1.3g/cc. Bulk Pumpable Explosives are generally used in blastholes containing water because they are water resistant, whereas ANFO is not. ANFO is used because it is cheaper and its firing characteristics suit some rock types. Because Bulk Pumpable Explosives are denser, the drilling pattern (burden and spacing) can often be increased.

Stemming material is added above the explosive column to the surface. The function of stemming material is to confine the gaseous energy from the explosion for the number of milliseconds taken for the explosive to be consumed and the rock mass to be fragmented and begin to move. Crushed aggregate $1/5^{\text{th}}$ to $1/10^{\text{th}}$ hole diameter is an ideal stemming material under all conditions in quarry blasting.

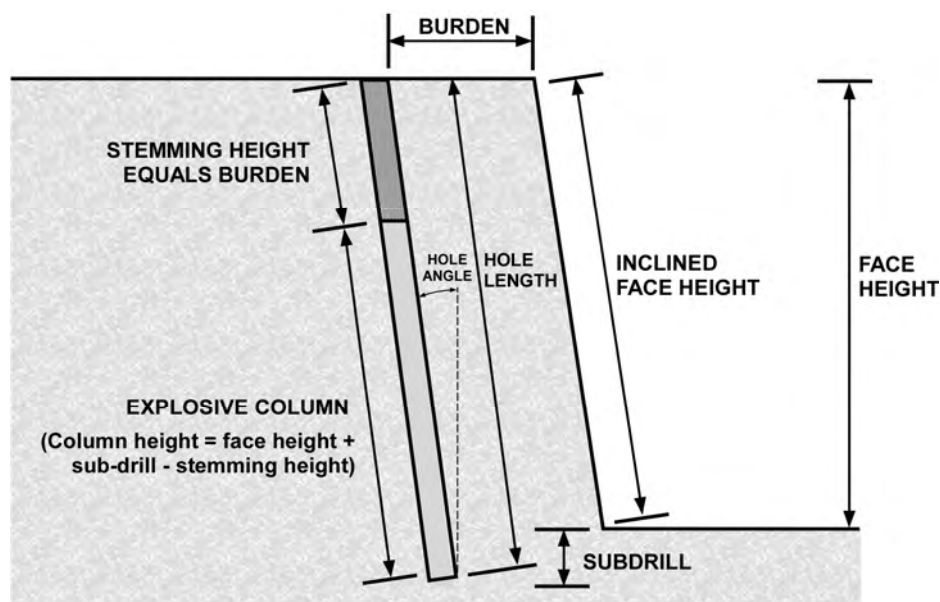


Figure A1.2 - Blasthole loading layout

It is common quarry practice for the number of blastholes loaded and fired in any one blast to vary between 80 or more holes. The explosives in each blasthole are initiated by signal tube delay detonators.

The signal tube leads from each blasthole are joined together by surface signal tube delay detonators to form a blasting circuit. At the approved firing time, after warning signals have been given, the blasting circuit is connected to an exploder and fired.

All blastholes do not, however, explode at the same instant of time. Reduced blast vibration and improved fragmentation result because the blastholes detonate in sequence, with a small time delay of several milliseconds between each explosion. This small time delay is provided by the surface signal tube delay detonators and an unlimited number of delay intervals are possible for large blasts. It is usual for only one blasthole to be exploded at any instant of time. In the case of 16 blastholes being fired in the one blast, a possible delay sequence is shown in **Figure A1.3**.

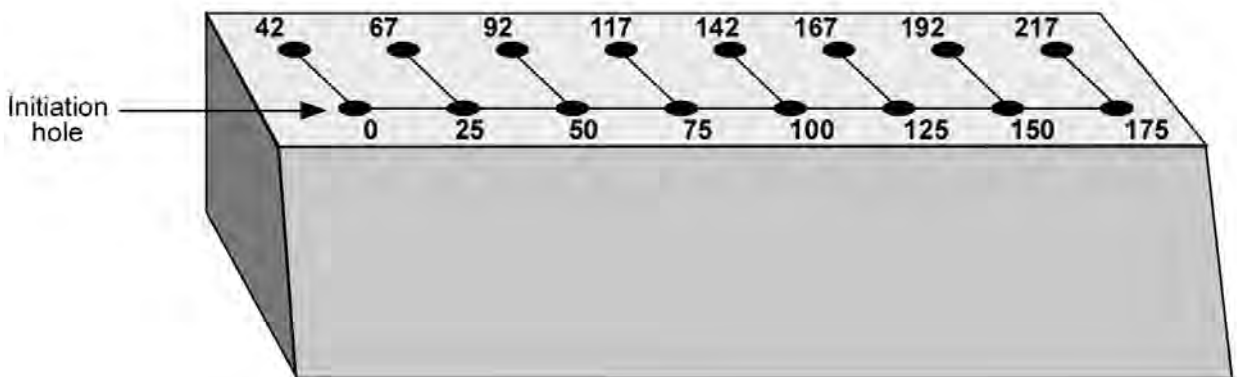


Figure A1.3 - Typical delay sequence showing blasthole firing sequence in milliseconds

In a typical firing sequence, the initiation hole at one end of the blast is detonated first, and is followed by the succeeding blastholes in the sequence shown. The total time for the 16 blastholes to be exploded would be approximately a fifth of a second, (217 milliseconds). The total time for 80 blastholes in this delay pattern would be about one second.

After a typical blast, the broken rock is left lying against the wall of the quarry excavation, as shown in **Figure A1.4**. The broken rock is then loaded into trucks and taken to the crusher.



Figure A1.4 – Rock pile left after a blast

A blast of 80 holes would break approximately 8,000 cubic metres of rock for a 12.0m high face. To maintain a production rate, blasts are fired at appropriate intervals to ensure a continuous supply of broken rock to the crusher.

A1.2 THE NATURE AND MEASUREMENT OF BLAST VIBRATION

Explosive energy produces the following effects:

- Rock shattering and displacement.
- Ground vibration.
- Air vibration.

The energy contained in explosives used in quarry blastholes is designed to break and displace rock, and the more of the energy available which can be utilised for that purpose the more efficient the blast. However, some of the energy cannot be utilised in breaking rock and creates vibration in the surrounding rock and air. Vibration from blasting in Australian quarries is usually regulated by limits specified in the regulatory permit under which the quarry operates.

A1.21. Ground Vibration

Ground vibration radiates outwards from the blast site and gradually reduces in magnitude, in the same manner as ripples behave when a stone is thrown into a pool of water, schematically shown in **Figure A1.5**. The motion of the wave can be defined by taking measurements of a float on the surface of the water. With suitable instruments we can measure the displacement or amplitude, the velocity, the acceleration of the float and the wave length of the waves.

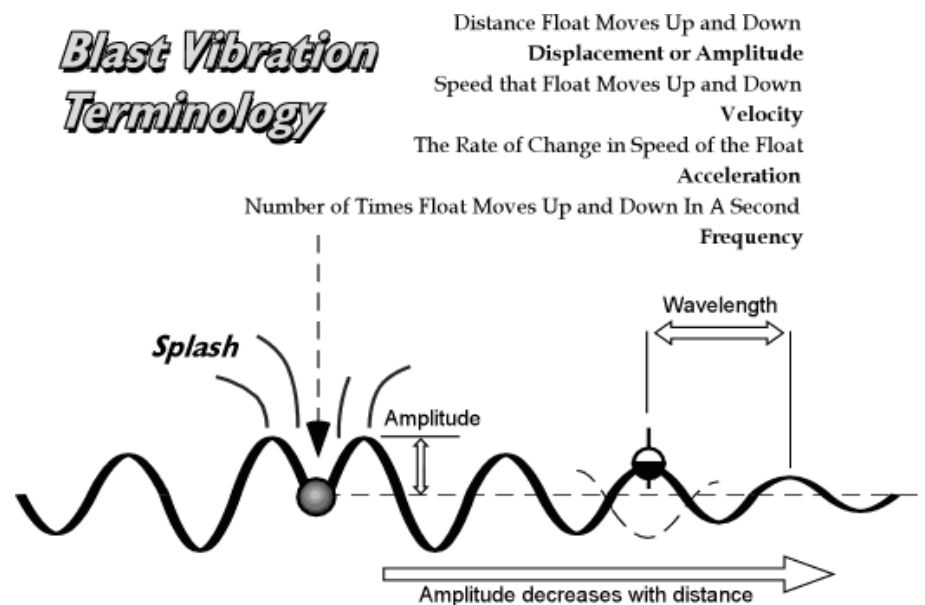


Figure A1.5 - Schematic diagram of vibration terminology

With ground vibration, the motion of the surface of the ground can be measured by coupling a suitable instrument directly to the surface.

Early researchers into ground vibration discovered a closer relationship between velocity of the ground surface and the response of structures than either displacement or acceleration. Measurement of velocity of the motion of the surface of the ground near where it enters a building has become the standard by which ground vibration is measured and regulated.

Ground vibration is measured with a blasting seismograph and is commonly expressed in terms of Peak Particle Velocity (PPV) and measured in terms of millimetres per second (mm/s). To define the motion in three dimensions, it is necessary to use three transducers to measure the vibration in three mutually perpendicular directions and then determine a Peak Particle Velocity or Peak Vector Sum (PVS), which is the instantaneous maximum vector of the three individual measurements:

$$\text{ie. PPV (PVS)} = \sqrt{v_t^2 + v_l^2 + v_v^2}$$

The ground vibration arriving at a location remote from a blast is a function of many factors, including:

- Charge mass of explosive fired in each hole.
- Distance from the blast.
- Explosives properties and coupling to the rock.
- Ground transmission characteristics.
- Origin of the rock, ie. Igneous or sedimentary.
- Presence of structures within the rock, such as bedding, faults and joints.
- Degree and depth of weathering at the surface.
- Initiation sequence and direction of firing.

Generally, all other factors being equal, the ground vibration increases with increasing charge mass and reduces with distance.

The manner in which ground vibration reduces with distance is demonstrated in **Figure A1.6**. This shows typical maximum vibration levels that result from a large blast (many holes) with a maximum charge mass of 50 and 100kg/hole.

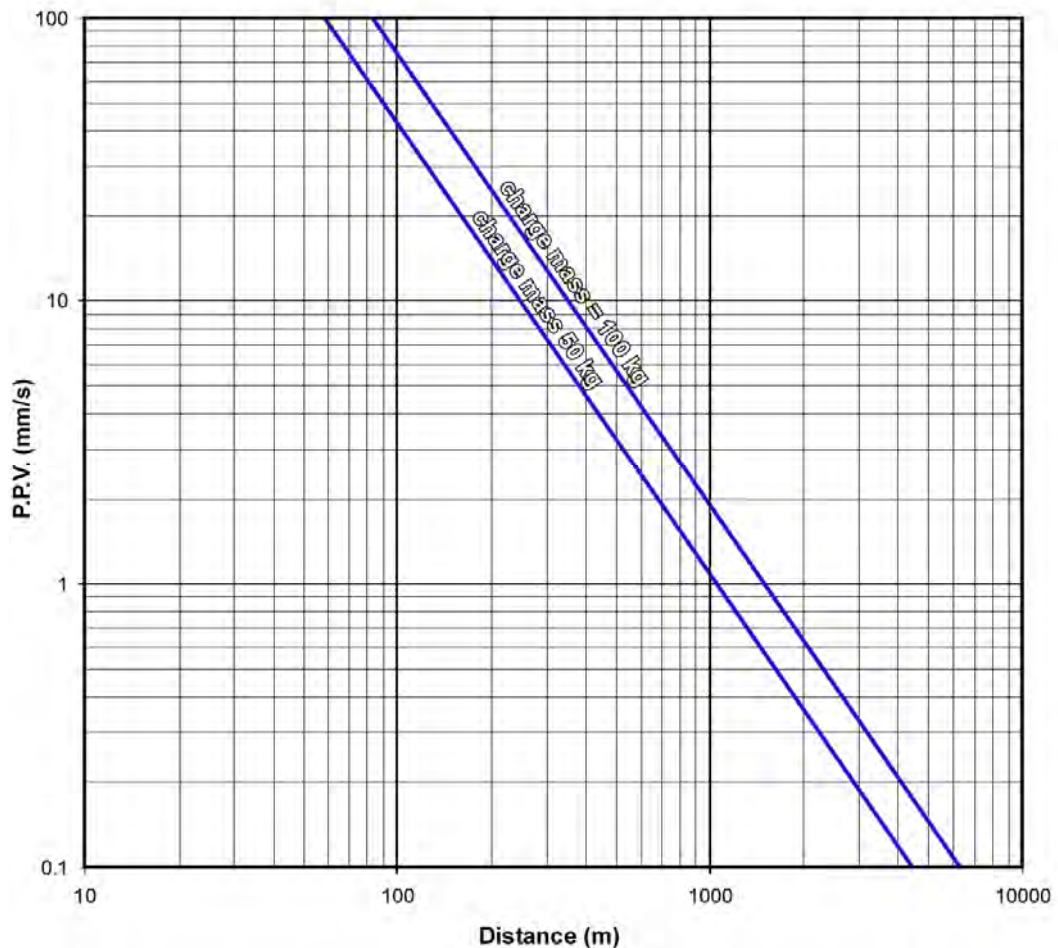


Figure A1.6 – Relationships between charge mass, distance and vibration levels

The relationships between charge mass, distance and vibration levels can be analysed and then used in a predictive formula to limit the ground vibration. The information in **Figure A1.6** can be produced in contour form and, if moved around an extraction outline, can be used to determine the maximum extent of each contour interval for each planned production stage or over the life of the quarry.

The predictive model for ground vibration is known as the Square Root Scaled Distance Site Law, or simply the Site Law. It has a general form, but a form found to be common in many quarries is:

$$PPV = k \left(\frac{\sqrt{m}}{D} \right)^{1.6} \quad [1]$$

where:

- PPV = Peak Particle Velocity
- m = Charge mass per hole (kg)
- D = Distance from blast (m)
- k = A site constant (1.6 is the site exponent)

A1.2.2. AIR VIBRATION ASSESSMENT

The air vibration levels resulting at a location remote from a blast are a function of many factors, including:

- Charge mass of explosives fired.
- Distance from the blast.
- Direction of the receptor relative to the free face.
- Confinement of the explosion by burden and stemming (height and stemming material).
- Topographic shielding.
- Burden, spacing and initiation timing sequence.

- The performance of the shotfiring crew during loading.
- Meteorological conditions at the time of the blast.

Generally, all other factors being equal, air vibration increases with increasing charge mass and reduces with distance.

From our research into air vibration, we have developed our own assessment model, which permits confinement conditions and face direction to be considered (Moore et. al. 1993 and Richards et al 2002). The model is incorporated in our ENVIB software, which has been accepted by the regulatory authorities in Victoria, New South Wales and Queensland.

The ENVIB model is that the basic emission from a quarry blast can be determined from the formula:

$$D_{120} = \left(\frac{250 \times d}{B} \right)^{2.5} \cdot \sqrt[3]{m} \quad [2]$$

where:

D	=	distance in front of the blast to the 120 dBL vibration level
d	=	hole diameter (mm)
B	=	burden (mm)
m	=	charge mass per hole (kg)

The model can be used to control airblast because it allows the front row burden to be designed to achieve vibration levels at sensitive sites.

The basic emission must then be modified for face conditions and topographical shielding. Wind has not been found to significantly effect the basic air vibration emission and its effects are not considered in the model.

For single bench quarry in flat topography, higher levels of blast vibration are recorded in front of the face than at the same distance behind the face. For the blast specifications used in this evaluation, measurements of 6-8 dBL higher are common in front of the face due to a 'face shielding' effect. This is illustrated below in **Figure A1.7**.

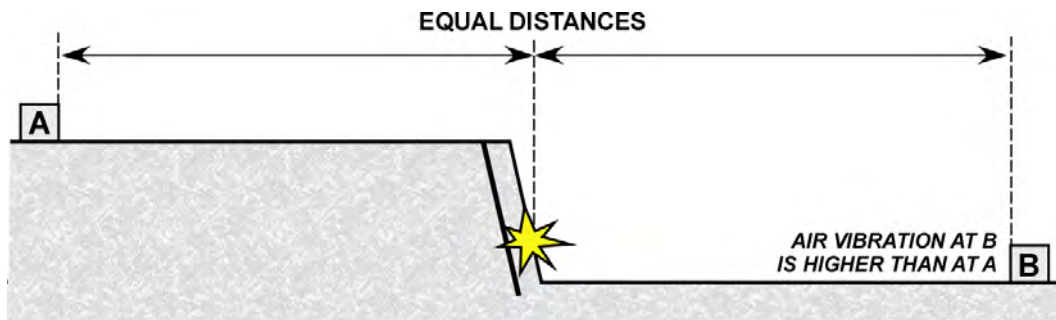


Figure A1.7 – The effect of the face on air vibration levels

Basic airblast emission contours for a quarry blast, with no topographical shielding, are shown in **Figure A1.8**. The specifications for this blast are 89mm diameter blast holes; 46kg/hole; 3.5m front row burden.

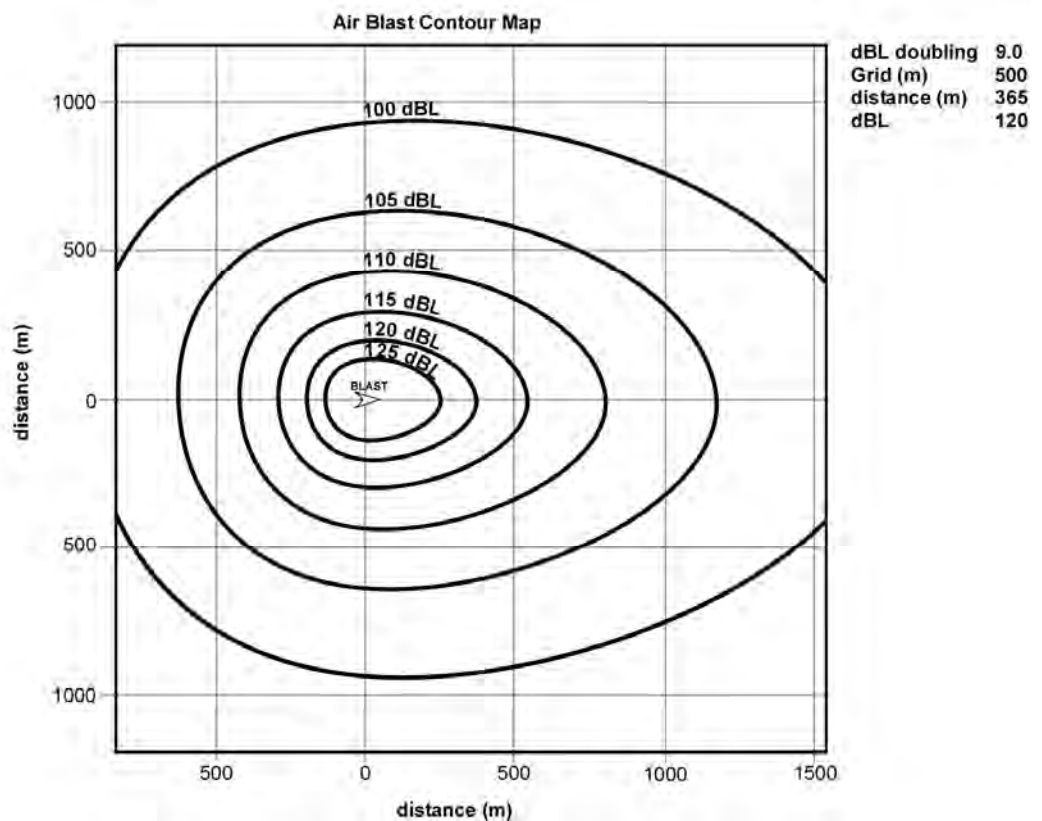


Figure A1.8 – Basic airblast emission contours for a quarry blast, with no topographical shielding (8dBL increase in front of blast)

In hilly topography and deep quarries, the contours are modified by shielding. The amount of shielding depends on the factors illustrated below in **Figure A1.9**.

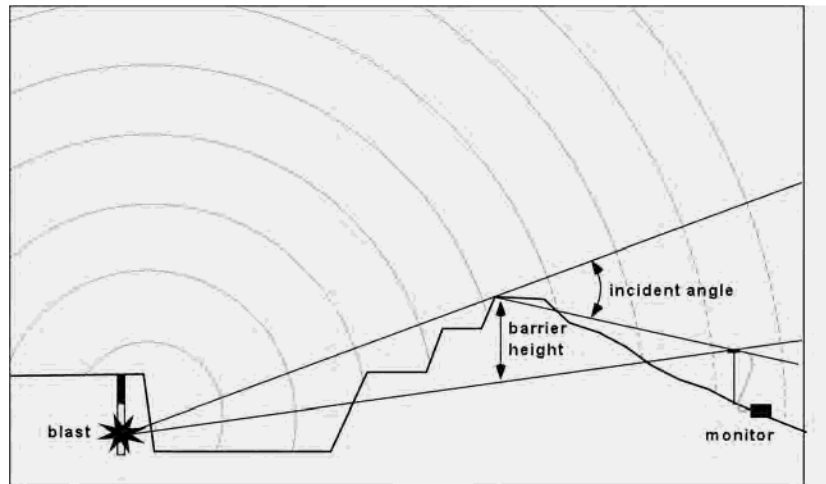


Figure A1.9 – The topographic effects on air vibration levels in more complex situations

Shielding is a function of the effective barrier height and the incident angle to the measuring point. The terms are illustrated in **Figure A1.9**. Our research has shown the amount of shielding afforded by the topography can be estimated from **Figure A1.10**.

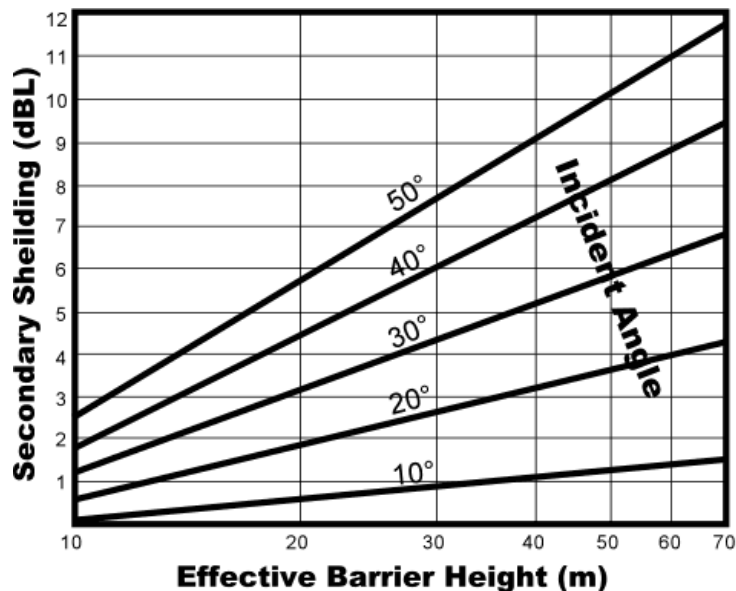


Figure A1.10 – Air vibration contours for current specification blasts, no shielding

It should be noted that the effects of shielding are only experienced beyond the perimeter of the quarry. Within the excavation, the air vibration levels are unaffected. The amount of shielding experienced around most quarries negligible unless they have several benches or are located in hilly terrain.

An air vibration assessment is made by moving the basic emission contours around the limit of extraction and, while observing blast orientation, record the maximum extent of each contour interval.

A1.2.3 EFFECTS OF METEOROLOGY ON AIRBLAST

Under 'normal' atmospheric conditions the airblast attenuates with distance and eventually reduces to levels that are below those of human perception. Under certain atmospheric conditions, the airblast levels at a distance from a blast may be increased by a mechanism known as 'meteorological reinforcement'. This is demonstrated in **Figure A1.11**.

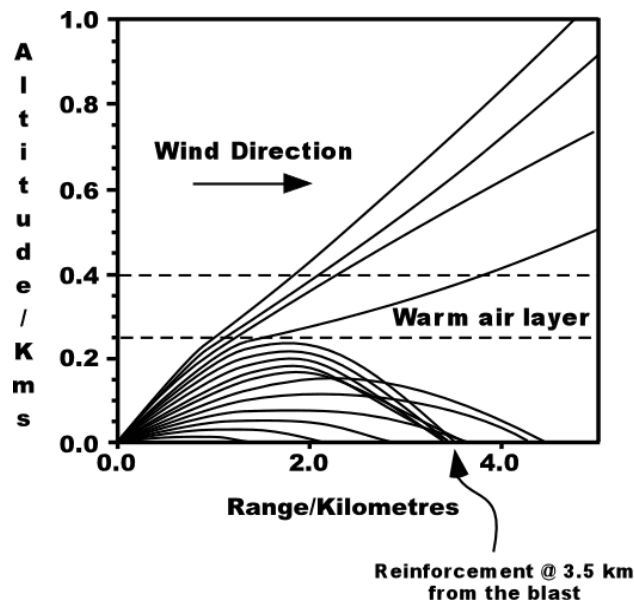


Figure A1.11- Combined effect of wind and temperature inversion on sound rays causing surface reinforcement

When an 'inversion' or layer of warm air between cold air layers occurs above a blast site, or wind velocity increases with altitude, the conditions may concentrate or focus the air vibration in certain directions and distances from a blast.

An inversion layer 60-200 metres from a blast can cause an increase of up to 10 or more decibels from 2-5 km from the blast. Wind velocity itself has little effect on airblast levels, although the change of pressure across the microphone due to wind velocity may influence the recorded signal and a spurious reading may result. Specialist techniques are available to separate airblast and wind on a recorded signal.

The practical effect of meteorology is that, on some occasions, people 2-5 km from the quarry who are usually unaware of airblast with normal attenuation, may experience airblast at perceptible levels. The possibility of airblast increase, due to meteorological conditions, can be reduced by firing mid-afternoon during late autumn/early winter, when any inversion is at its highest and also by delaying firing if it is just below the cloud level.

A1.3 FLYROCK

It is a common aim of blasting to fracture and fragment rock and the broken rock mass to be moved by displacement of the front row followed by the volumetric expansion of the rock from other rows; i.e. normal rock movement. A consequence of blasting that must be controlled is flyrock or the unpredictable throw of rock fragments from a blasting site. Flyrock inevitably results from overloading (too much explosive) or under confinement (too little burden or stemming).

The flyrock resulting from blasting can be predicted using models developed by Terrock and calibrated from the analysis of accurate data from flyrock incidents. The recent availability of GPS, face profiling, measured explosive loading and recent site aerial photographs has greatly improved the accuracy of the parameters to model.

The model was developed using the basic trajectory formula which equates the launch velocity and launch angle, combined with a scaled burden (or scaled stemming height) formula which equates the launch velocity with confinement conditions and charge mass. The flyrock direction depends on whether the least confinement is from the burden in front of a hole or the stemming practice at the collar of the hole.

A1.3.1. BURDEN CONTROLLED CONDITIONS

In hard rock quarries, the potential for flyrock in front of a face is a function of the minimum burden conditions and hole diameter according to the model:

In hard rock quarries, the potential for flyrock in front of a face is a function of the minimum burden conditions and hole diameter according to the model:

$$L_{\max} = 74.4 \left(\frac{\sqrt{m}}{B} \right)^{2.6} \quad [3]$$

where: L_{\max} = maximum throw (m)
 m = charge mass per metre (kg)
 B = minimum burden (m)

The maximum throw L_{\max} is to a point at the same level as the blast. The maximum throw results from launching the rock at a 45° angle. For 102mm diameter blast holes with an explosive charge of 10.6kg/m and a minimum front row burden of 4.0m, the predicted flyrock throw is 44m. This is most likely to occur in a 90° arc centred perpendicularly to the face (see **Figure A1.12**).

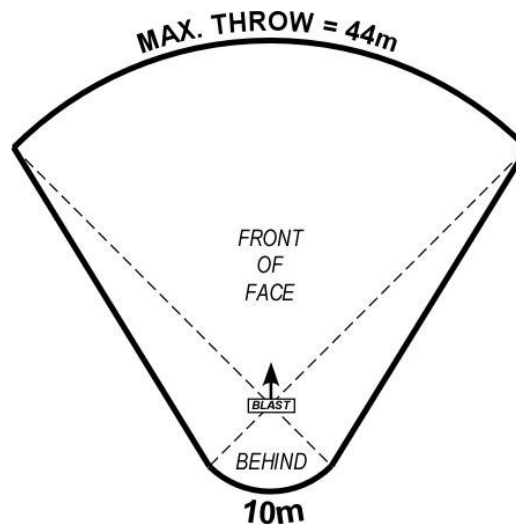


Figure A1.12 – Construction of maximum throw projection

The effect that changes of burden have on the maximum throw is shown in **Figure A1.13**. As the burden reduces, the maximum throw increases by the parabolic curve shown. At the 4.0m burden, the maximum throw is 44m. If the minimum burden front row burden is 3.5m, the maximum throw is 62m. However, if a hole is loaded with a front row burden of 1.5m, the maximum throw is about 560m.

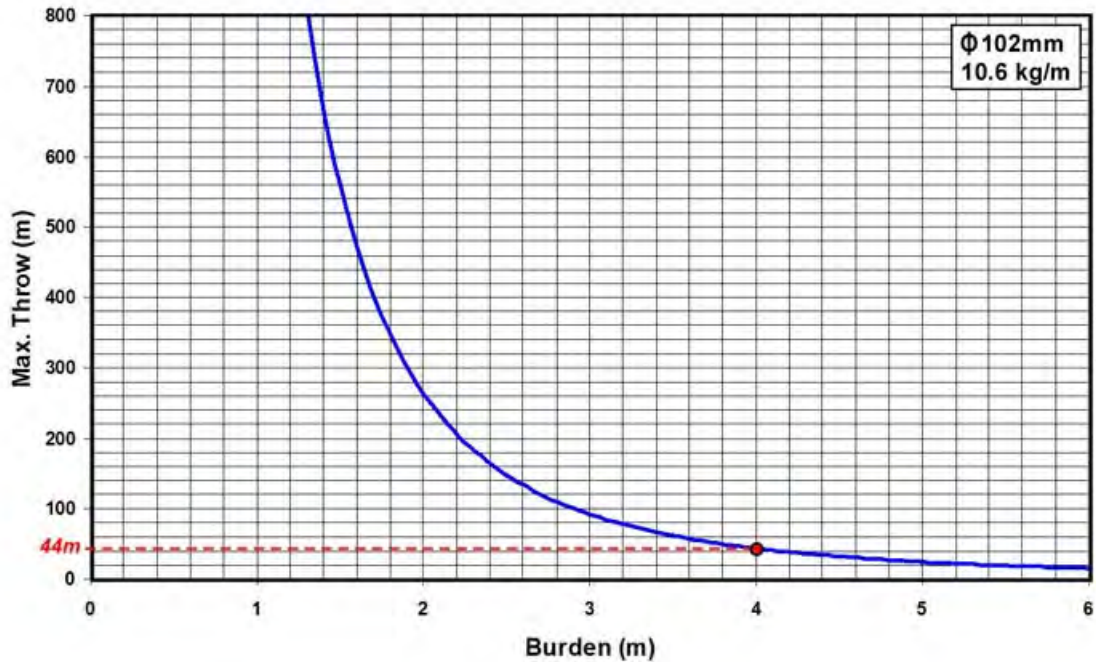


Figure A1.13 - Maximum throw vs. burden

A1.3.2. STEMMING CONTROLLED CONDITIONS

Behind the blast there are two possibilities for flyrock:

- Cratering
- Stemming ejection (rifling, or gunbrelling)

Cratering is the formation of a cone shaped excavation at the surface by a shallow charge, ie; insufficient stemming height. In the cratering case, it is possible for the launch angle to be 45° and the prediction model becomes:

$$L_{\text{Cratering}} = 74.4 \left(\frac{\sqrt{m}}{S.H.} \right)^{2.6} \quad [4]$$

Providing the stemming height is greater than about 10-15 hole diameters, cratering does not occur. The only potential for flyrock behind the face then is from stemming ejection which may carry with it small stones from the hole walls and collar. The stemming ejection model is:

$$L_{\text{behind}} = 74.4 \left(\frac{\sqrt{m}}{S.H.} \right)^{2.6} \sin 2\phi \quad [5]$$

Where S.H. = stemming height (m)

ϕ = launch angle

= hole angle – 5° dispersal allowance (eg; for a vertical hole, $\phi = 90^\circ - 5^\circ = 85^\circ$)

For a 102mm diameter, the maximum throw behind the face with a 3.6m stemming height is:

$$L_{\text{behind}} = 74.4 \left(\frac{\sqrt{10.6}}{3.6} \right)^{2.6} \sin 170^\circ = 10\text{m} \quad [6]$$

For a vertical hole, flyrock from stemming ejection has the potential to land within a 21.0 metre radius.

The worst case flyrock throw is determined by a graphical construction which combines the burden controlled distance and the stemming controlled distance as shown in **Figure A1.14**.

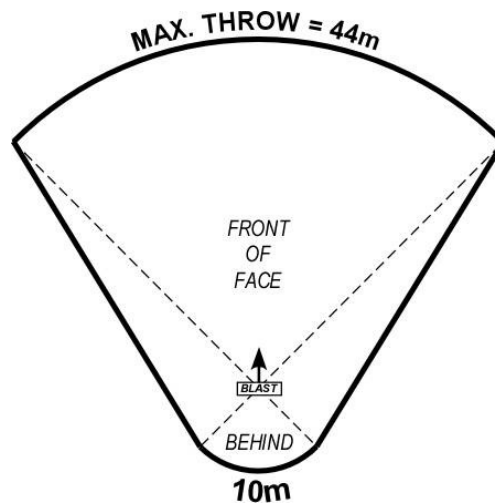


Figure A1.14 - Combined max throw distances based on current blasting practice

The sensitivity of flyrock to changes of stemming height can be demonstrated in **Figure A1.15**. Again, the maximum throw increases with reduction of stemming height. A 3.6m stemming height would result in a maximum throw of 10m.

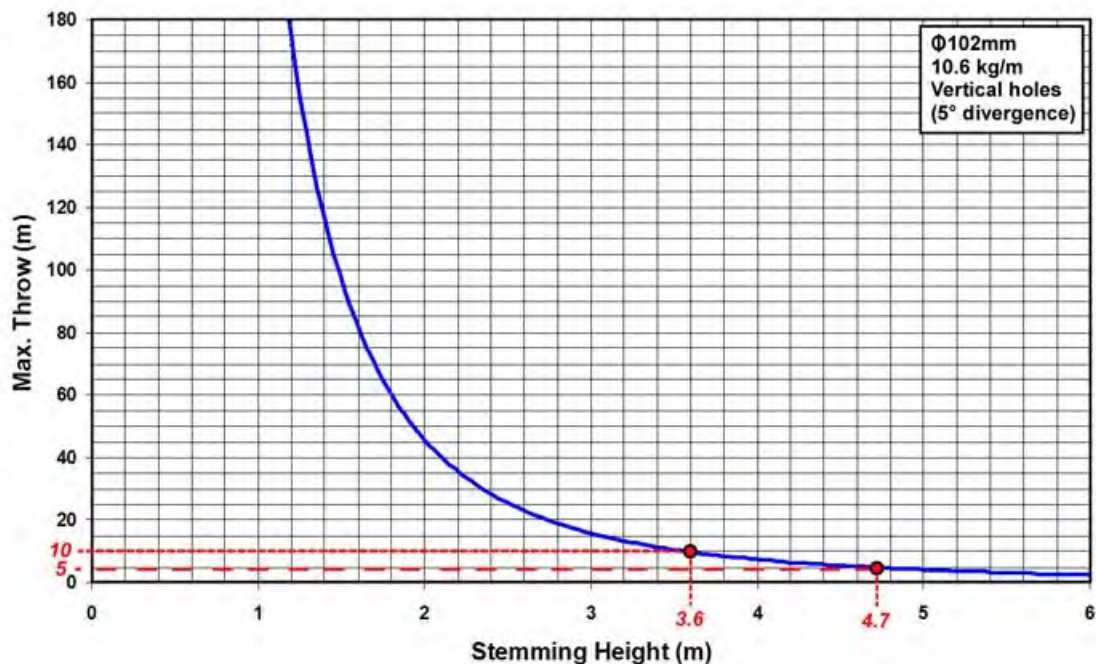


Figure A1.15 – Maximum throw vs. stemming height

A1.3.3. FLYROCK HEIGHT

The height that flyrock can reach is also a function of basic trajectory theory and confinement conditions according to the Terrock model.

$$h = 37.2 \left(\frac{\sqrt{m}}{B} \right)^{2.6} \sin^2 \phi \quad [7]$$

Where: h = height reached by flyrock (m)
 m = charge mass (kg/m)
 B = burden or stemming height (m)
 ϕ = launch angle

The trajectory paths of the two examples are shown in **Figure A1.16**. Based on maximum trajectory heights determined as follows:

1. Burden case: $h = 37.2 \left(\frac{\sqrt{10.6}}{4.0} \right)^{2.6} \sin^2 45^\circ = 10.9m$ [7]

2. Stemming case $h = 37.2 \left(\frac{\sqrt{10.6}}{3.5} \right)^{2.6} \sin^2 85^\circ = 30.6m$ [8]

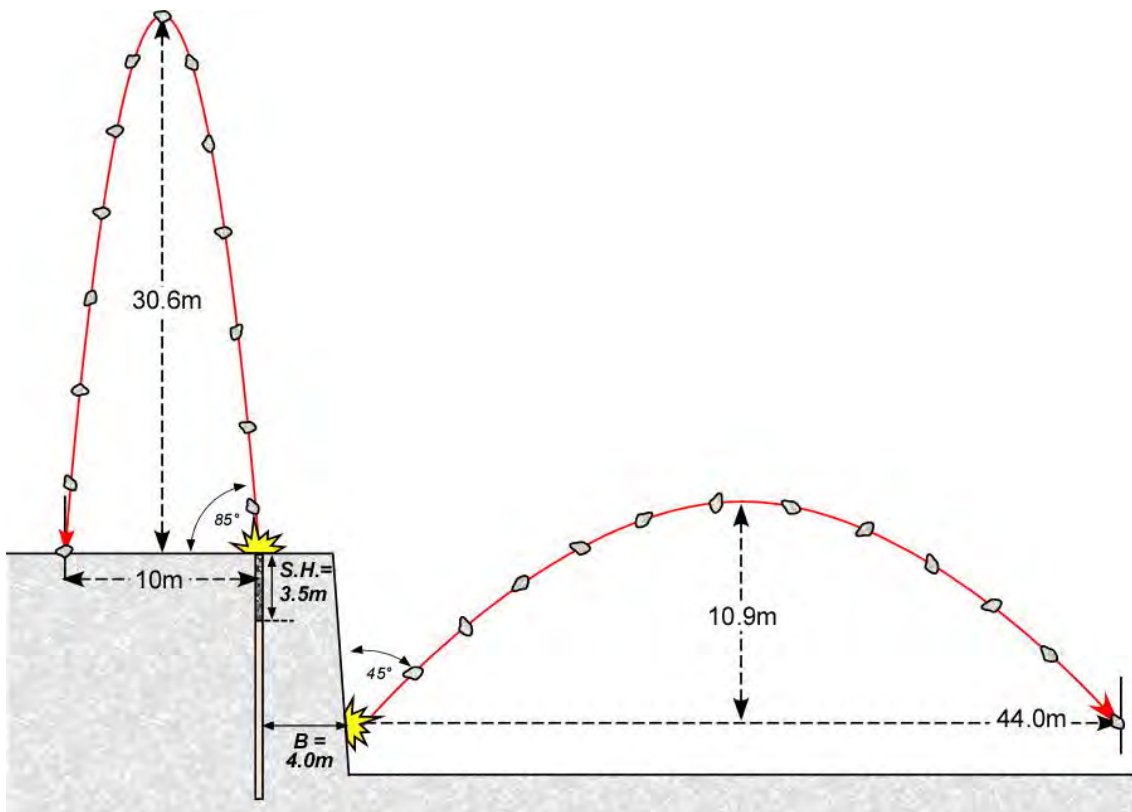


Figure A1.16 – Flyrock trajectory, in front of and behind the face

A1.4 ENVIRONMENTAL BLAST DESIGN

The steps to be taken in the environmental blast design process to limit ground vibration, air blast and flyrock are shown in the flow chart shown in **Figure A1.18**.

It also includes a performance review loop to allow the design criteria to be modified in the light of experience.

ENVIRONMENTAL BLAST DESIGN PROCEDURE

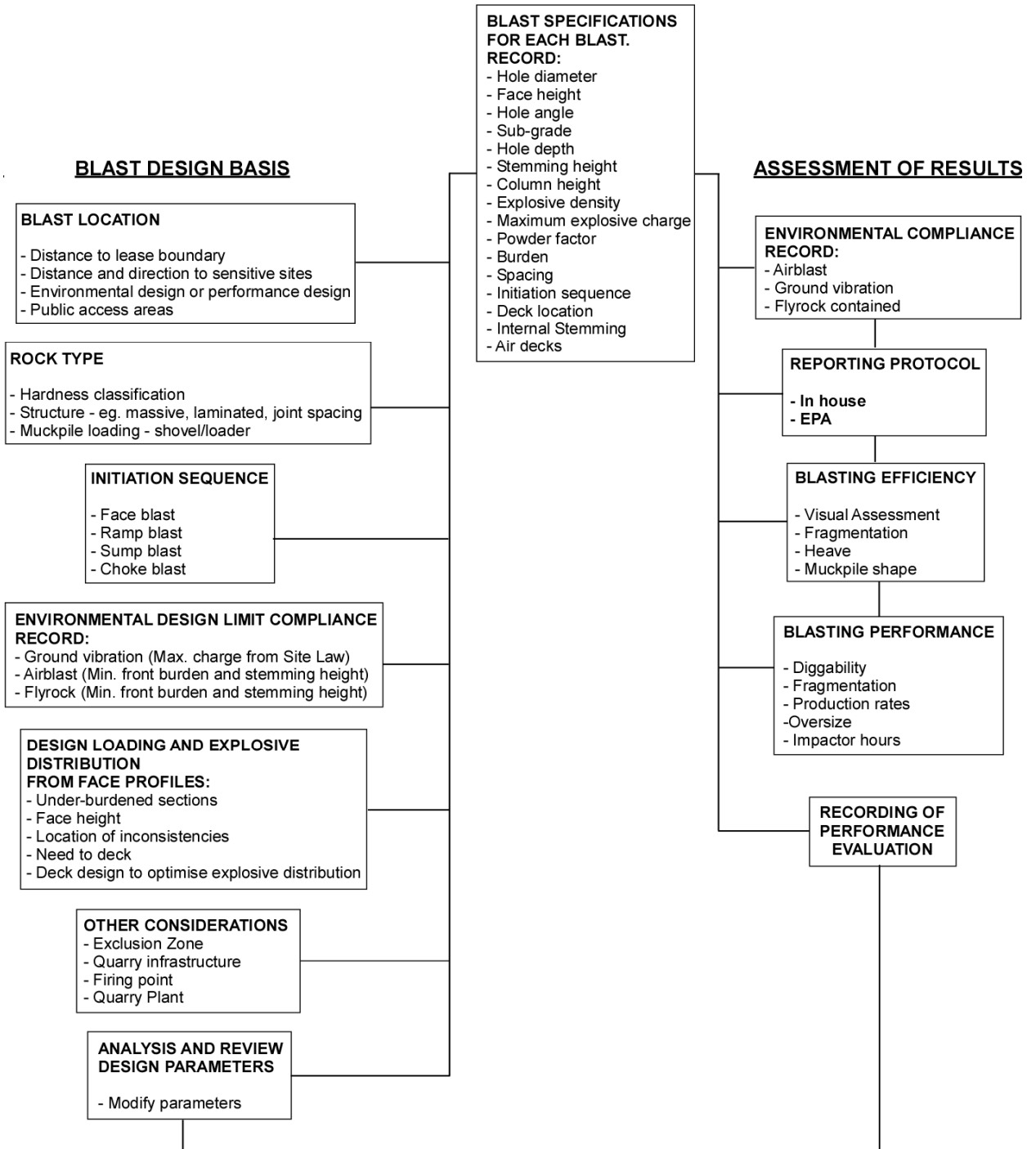


Figure A1.18 – Blast design flow chart

GLOSSARY

The definitions of some terms used in these notes are as follows:

ANFO – a mixture of ammonium nitrate and fuel oil.

Airblast – the airborne shock wave or pressure pulse generated by a blast.

Airdeck – an air gap left between the top of the explosive charge and a plug below the stemming. Used as a contour blasting method to spread the pressure from the explosive over a larger volume thereby reducing the explosive effect on the perimeter holes.

Burden – the distance between the main charge in the drill hole and the nearest point on the free face. Also the distance between rows of holes perpendicular to the face.

Collar – the uncharged section of a drill hole left at the top or beginning of the drill hole, i.e. the portion in which the stemming is usually placed. Alternatively, the hole at the surface

Collaring (Cratering) – the formation of a crater at the top or beginning of a drill hole. Collaring occurs when the stemming depth is insufficient.

Column charge – a continuous column of explosive in a drill hole

Cut-off (Cut-off holes) – a charged drill hole which has been partially sheared by the explosion in an adjacent hole, before its own charge has exploded. A common source of misfires.

Deck charging – charges placed above a base charge at preselected intervals which are separated from the base charge and each other by sand stemming.

Density – the mass per unit volume of an explosive usually expressed in g/cm^3 . Density determines the quantity of explosive which can be placed in each size of drill hole.

Bulk Pumpable Explosives explosive – is a water resistant explosive containing an oxidizer such as Ammonium Nitrate dissolved in water to form droplets that is surrounded by a thin layer of oil and stabilized by various emulsifiers.

Face – a wall of rock usually, nearly vertical, either naturally formed or developed by blasting

Floor – the horizontal surface left after blasted rock has been cleared.

Flyrock – any rock fragments thrown unpredictably from a blast. Results from overloading too much explosive; or under confinement – too little burden or stemming.

Ground vibration – vibration transmitted through the ground as an elastic wave from an energy source such as blasting or ground compaction.

Misfire – the failure of an explosive charge to explode properly when detonated or when disconnected from the initiation signal.

Primer – that portion of the charge which initiates the remainder of the charge. The primer is usually a cartridge containing a detonator or coupled to a detonating fuse.

Perimeter blasting – the firing of lightly charge perimeter holes either prior to or at the same time as the main charge, to form a smooth face. This term includes pre-splitting, post-splitting and smooth blasting.

Signal tube – (detonator) an initiation accessory consisting of a hollow plastic tube coated internally with a dusting of explosive material. It is used to transfer the ignition signal to a detonator crimped at the end by a shock wave that propagates inside the tube without damaging the tube itself.

Shotfirer – the person directly responsible for preparing, charging and firing explosives.

Spacing – the horizontal distance between drill holes measured parallel to the face.

Stemming height – the distance between the hole collar and the top of the explosive column. It is common in quarries for the stemming height to equal burden to control air blast.

Stemming material – material placed above the explosive column to confine the energy of the explosion within the rock mass for the several milliseconds required for the explosive to be consumed, and the rock to be fragmented and begin to move. An ideal stemming material under all conditions in quarry blasts is crushed aggregate of a size $1/5^{\text{th}}$ to $1/10^{\text{th}}$ blasthole diameter.

Sub-drilling – the depth to which the drill hole is taken below the floor or planned formation level.

Toe - the fillet of rock remaining between the face and the floor, after blasting or alternatively, the bottom of the face.

Appendix 9

Blast Management Plan



Holcim (Australia) Pty Ltd

NICKOL BAY QUARRY

**M47/26; M47/48; M47/255; M47/306;
M47/309; M47/331; M47/333; M47/353**

BLAST MANAGEMENT PLAN

JANUARY 2010

'AMENDMENT 2'

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1. INTRODUCTION

This Blast Management Plan records the processes, systems and responsibilities applicable to the transport, storage and use of explosives at Holcim to ensure that blasting operations are conducted safely and in such a way that there will be no significant impact on National development. All operations are conducted in accordance with the Holcim Safety, Health and Environment Policy and Conditions (refer to Appendix 1).

This document summarises the requirements of the various Regulations, Standards and Codes and the legislative conditions under which the quarry operates and details the procedures to be implemented to ensure that all activities associated with drilling and blasting at the Nickol Bay Quarry will have no significant impact on National heritage Values and will not damage or disturb Aboriginal Heritage Sites or nationally heritage listed areas.

2. APPLICABLE LEGISLATION AND REGULATIONS

Blasting operations at the Nickol Bay Quarry are conducted under the requirements of the following standards, codes and regulations. In addition, the quarry operations themselves are also subject to compliance with the following legislation.

Standards, Codes & Regulations	Legislation
<ul style="list-style-type: none"> • Australian Standard 2187.1 (1998): Explosives - Storage, Transport and Use, Part 1 - Storage • Australian Standard 2187.2 (2006): Explosives - Storage, Transport and Use, Part 2 - Use of Explosives • Australian Explosives Code - Third Edition - April 2009 • WA Mines Act 1978 • WA Mines Safety and Inspection Act 1994 • WA Mines Safety and Inspection Regulations 1995 • WA Dangerous Goods Safety Act 2004 • WA Dangerous Goods Safety (General) Regulations 2007 • WA Dangerous Goods Safety (Explosives) Regulations 2007 • WA Occupational Safety and Health Act 1984 • WA Occupational Safety and Health Regulations 1996 	<ul style="list-style-type: none"> • Aboriginal Heritage Act 1972 • Bush Fires Act 1954 • Conservation and Land Management Act 1984 • Environmental Protection Act 1986 • Environmental Protection (Noise) Regulations 1997 • Environmental Protection (Clearing of Native Vegetation) Regulations 2004 • Heritage of Western Australia Act 1990 • Land Administration Act 1997 • Land Government Act 1995 • Planning and Development Act 2005 • Wildlife Conservation Act 1950 • Environmental Protection and Biodiversity Conservation Act 1999

3. RESPONSIBILITIES

It is the responsibility of the Holcim North West Manager and the Holcim Nickol Bay Quarry Manager to ensure that all blasting operations are conducted in accordance with the applicable legislation, regulations and codes of practice listed in section 2.

It is also the responsibility of the Holcim North West Manager and the Holcim Nickol Bay Quarry Manager to ensure that this Blast Management Plan is implemented.

It is also the responsibility of Holcim personnel to fulfill the specific responsibilities as specified for each activity listed in *Section 3: Responsibilities*, shall be implemented by the personnel as listed.

In addition the following responsibilities shall be implemented by the personnel as listed.

3.1 Quarry Manager

3.1.1 Blasting Operations

- Ensure that blasting is only conducted during the hours specified in the Blasting Plan.
- Firing times at the Holcim Nickol Bay Quarry are daylight hours, except as otherwise provided in WA Mines Safety and Inspection Regulations 1995, Section 8.28.
- Appoint a Shotfirer before blasting operations commence and record the name of the Shotfirer.
- Ensure that all equipment connected with the use of explosives is in good repair and efficient condition.
- Ensure that the Shock Tube Starter is approved by the blasting operation contractor (Maxam).
- Ensure that airblast overpressure and ground vibration from blasting does not exceed the limits specified by the regulations.
- Ensure that damaged, defective or deteriorated explosives are not used in connection with a blasting operation and must be destroyed or disposed of in an approved manner.

3.1.2 Misfires

- The Quarry Manager must decide the procedure for treating misfires and supervise the treatment, subject to instructions issued by the blasting operation contractor (Maxam).
- Ensure that the blasting operation contractor (Maxam) examine the blasting site and ascertain the location and cause of the misfire and search for, collect, store and

later safely dispose of any unexploded explosives or debris containing explosive in an approved manner.

- Treat the misfire in an appropriate manner. If when refiring, the misfire may endanger persons or property if fired in a prescribed manner, the Quarry Manager must obtain the approval of the Department of Mines and Petroleum for an alternative treatment.
- If the Quarry Manager must leave the site before the misfire is treated, he must give written notice of the location and treatment to the person who will assume charge and to the Shotfirer.

3.2 THE SHOTFIRER

3.2.1 Quarry Operation, Health and Safety

- The Shotfirer must be appointed by the Quarry Manager and his/her name recorded in the Blast Report
- The Quarry Manager at the Holcim Nickol Bay is Mr. Lachlan Green.
- Not act as a Shotfirer unless he/she holds a valid licence to use explosives.

3.2.2 Explosives Storage

- No explosives to be stored on site

3.2.3 Blasting Operations

- Ensure that all equipment connected with the use of explosives is in good repair and efficient condition.
- Ensure that precautions are taken to prevent flyrock travelling unreasonable distances and to prevent accidents by fire or explosion.
- Ensure that he/she is responsible for the drilling and charging operations.
- Notify the Quarry Manager immediately if rock flies beyond the quarry boundary as the result of an explosion.
- Complete internal reporting of flyrock incidents within the Quarry boundary.

3.2.4 Misfires

- Notify the Quarry Manager of any misfire.
- Ensure that no person enters the area of the misfire until five minutes (for electric or signal tube firing) has elapsed and all post blast fumes have dispersed.

3.2.5 Destruction of Explosives

- No explosives will be thrown away, discarded in any rubbish collection or buried.
- The Shotfirer will directly supervise the destruction of all unwanted explosives in accordance with Section 5.11 of this document.
- These may include damaged, defective or unwanted explosives and/or detonators and the empty packaging from these products.

3.3 PERSONS ABOUT A QUARRY

3.3.1 Quarry Operation, Health and Safety

All quarry employees and contractors must:

- Take all measures to ensure that the workplace and means of access and egress are safe and without risks to health.
- While at work, take reasonable care for his/her own health and safety and for the health and safety of anyone else affected by his/her acts or omissions.
- Not do or omit to do anything that may endanger the life or safety of any person.
- Not wilfully or recklessly interfere with or misuse anything provided in the interest of health, safety and welfare or wilfully place at risk the health and safety of any person at the workplace.
- Notify the Quarry Manager immediately upon seeing circumstances or conditions that may cause danger to persons or damage to plant, machinery or buildings.
- Wear the appropriate Personal Protective Equipment (PPE) provided in proclaimed areas of the quarry.
- Not take intoxicating liquor or drugs of addiction into the quarry or be under the influence of alcohol or drugs while in the Quarry.
- Submit to random drug and alcohol testing when required.
- The driver of a vehicle or mobile equipment must conform to speed restrictions and traffic control signs within the quarry.
- All persons in vehicles will wear seat belts when the vehicle is in motion.
- Drivers of all vehicles must give way to quarry production vehicles on or when entering roads.
- When blasting occurs within range of his/her working place, withdraw to a known safe location.

3.4 PERSONS ASSISTING WITH THE SHOT

In addition to Section 3.3, persons assisting with the shot must:

- Not handle explosives unless they hold a licence to use explosives or are under the direct supervision of a person with a current relevant licence.
- Not fire a shot unless he/she holds a licence to use explosives in a quarry.
- Not handle explosives or be in the vicinity of a magazine while under the influence of alcohol or drugs.
- Submit to random drug and alcohol testing when required.
- Act as directed by the Shotfirer.

3.5 Contractors and Visitors

3.5.1 Entering and Leaving the Quarry

Contractors and people visiting the Quarry must:

- Report to the office or weighbridge upon entering or leaving the Quarry property and undertake the entry protocol.
- Protocol at the Holcim Nickol Bay Quarry is to sign the Visitors' Book to make the Quarry Manager aware the visitor or contractor is on the property. A new contractor to the site must undertake the site induction. The Visitors' Book must be signed on leaving the Quarry.
- Display an amber flashing light on their vehicle while in the Quarry. Vehicle flags are not required at this Quarry.
- Do as directed by the Quarry Manager.
- Be aware of their responsibilities listed under Sections 3.4 and 3.5 'Persons about a Quarry'.

3.5.2 Provision of Services

- Contractors have obligations and responsibilities defined in the relevant contract agreement; however, they also assume the responsibilities of persons about a quarry and persons assisting with the shot.
- Contract Shotfirers must accept the statutory responsibilities of the Shotfirer, regardless of the shottfiring services they have contracted to supply. The use of contractors does not reduce the statutory responsibilities of the Quarry Manager.

- The Quarry Manager and Shotfirer should clearly understand their roles when contractors are employed on site and exercise management and control of the contractors to ensure that they comply with their statutory responsibilities.

4. BLASTING PROCESS

Blasting is a controlled process that can be represented by the Flow Chart (See Figure 1) for quarries located in environmentally sensitive areas. This summarizes the steps in the process to conduct a blast safely, to control the environmental impacts to achieve regulatory compliance and to evaluate performance of a routine blast.

The process can also be considered under the following headings (Refer to Holcim - SHE Guide).

1. Blast design and layout
2. Drill Blast holes
3. Design blast and source explosives
4. Day of blast preliminaries
5. Loading Explosive
6. Firing the blast
7. After the "All Clear"
8. Precautions when a storm approaches
9. Dealing with misfires
10. Transporting explosives around the quarry
11. Storage of explosives on site
12. Theft of explosives
13. Fire
14. Treatment of misfires

The listed headings correspond to the flow chart down to point 7 for a routine blast.

Headings 8 – 14 deal with other blasting issues that arise periodically and must be dealt with accordingly.

5. HOLCIM NICKOL BAY QUARRY BLASTING PROCEDURE

The purpose of this procedure is to specify the blasting requirements for drill and blast events at the Holcim Nickol Bay Quarry to ensure the safety of all Holcim personnel and contractors and the protection of nationality heritage listed areas and Aboriginal Heritage sites.

5.1 Site Details

Site:	NICKOL BAY QUARRY
Date prepared:	NOVEMBER 2009
Quarry Manager:	Lachlan Green
Drill, Blast & Explosives Contractors:	Maxam (Australia) Pty Ltd
Shotfirer(s) and certificate number(s):	Robert Rowe WA Shotfier #ESF010823 Expiry: 17/09/2011 Andrey Molnar WA Shotfirer # ESF010544 Expiry: 02/11/2011 Rino Diotallevi WA Shotfirer # ESF011933 Expiry: 27/08/2012

5.2 Notification Requirements

The following people/groups shall be contacted prior to a planned drill and blast event to notify them of the details of the drill and blast event.

Group/Individual		Contact Nos.
Neighbours	Karratha Airport Manager Mr. Chris Fox	(08) 9186 8563 0417 904 053
	Hanson Concrete	(08) 91 851 599
	Karratha Shooting Club Mr. Phil Nix	0429 791 267
Shire	Shire of Roebourne	(08) 9186 8555
Others	Staff/Employees	Notify verbally & Sign in lunchroom
	Contractors	Notify verbally & Sign at Office sign in
	Visiting Truck Drivers	By Weighbridge Operator

5.3 Monitoring Requirements

5.3.1 Ground Vibration

Maxam shall install 3 × vibration monitors to record vibration (PPV mm/s) resulting from blasting activities. These monitors are placed at the following locations:

Monitor No/Name	Location Description	Coordinates MGA Zone 50 GDA 94
Monitor 1	West side of Aboriginal Quarry	473,054.7mE 7,714,260.6mN 71.0m AHD
Monitor 2	East side of Aboriginal Quarry	473,112.3mE 7,714,318.8mN 74.2m AHD
Monitor 3	Communications Tower 1	473,032.1mE 7,714,415.4mN 83.9m AHD

5.3.2 Airblast

Maxam shall monitor for airblast during all drill and blast events. Airblast shall be monitored at the following locations:

Monitor No/Name	Location Description	Coordinates MGA Zone 50 GDA 94
Monitor 1	West side of Aboriginal Quarry	473,054.7mE 7,714,260.6mN 71.0m AHD
Monitor 2	East side of Aboriginal Quarry	473,112.3mE 7,714,318.8mN 74.2m AHD
Monitor 3	Communications Tower 1	473,032.1mE 7,714,415.4mN 83.9m AHD

5.3.3 Video Recording

Maxam shall set up video cameras to record the blast event. All video recordings shall be provided to Holcim with the Drill and Blast Report.

5.4 Clearance of Persons from Hazardous Areas/Site Security

5.4.1 Risk Assessment

Prior to a Drilling and Blasting event occurring it is the responsibility of the Quarry Manager to ensure a risk assessment has been completed (refer to example in Appendix 3).

5.4.2 Persons on Site

- Everyone, except for persons involved in the blast process (blast guards and shotfirer) shall vacate the site, outside the blast exclusion zone.
- The Quarry Manager shall check the visitor's sign in book to ensure that they have vacated the site.
- A physical barrier (eg: front loader) shall be placed across the road at the entry/exit to the weighbridge.

5.4.3 Neighbours/Others

Prior to blasting as part of the evacuation procedure, the Quarry Manager shall drive around the site when practicable to check for neighbours and people within the blast exclusion zone.

5.4.4 Blasting Shelter

There is no approved blasting shelter for this site. When blasting occurs, withdraw to a known, safe location is compulsory (access road to the quarry).

5.4.5 Blast time limitations

Blasting can only occur between sunrise and sunset, from Monday to Sunday, except as otherwise provided in WA Mines Safety and Inspection Regulations 1995, Section 8.28.

5.5 Drill, Blast and Explosives Contractor Procedures

Maxam shall comply with all Holcim procedures including this Blast Management Plan at all times. In addition, Maxam shall undertake the drill and blast activities in accordance with the following Maxam procedures approved by Holcim (Appendix 4).

- 3-01-1 Drill and Blast Procedure
- 3-01-2 Dealing with misfires
- 3-02-0 Lightning/Storm activity

5.6 Blast Controller, Shotfirer Duties and Firing Procedure

The blasting notices, notifications and blast control procedures at the Nickol Bay Quarry are detailed in Safe Work Procedure SWP NBQ 069. (Appendix 5) and shall be followed at all times.

Persons acting as the Blast Controller are required to read and sign off that they have understood SWP NBQ 069.

5.7 Environmental Blast Design

The Quarry Manager and Maxam shall ensure that all drill and blast events are designed in such a way that they will have no significant impact on National heritage Listed areas or cause damage or disturb any Aboriginal Heritage Sites (refer to map – Appendix 6). A critical design objective is to ensure that stable faces are treated at the ultimate face at the extraction limit located at a minimum distance of 10m from the tenement boundary, conservation zone and Aboriginal Heritage Sites.

The design of a blast event in an environmentally sensitive site shall incorporate the blast design activities and assessment of results as shown in the flowchart Figure 1.

The main issues at the Nickol Bay Quarry that could potentially have an impact on National Heritage Listed areas and/or Aboriginal Heritage Sites are flyrock, vibration and wall stability. This section of the blast management procedure details the process for managing these issues.

However, it is incumbent on the blasting contractor (Maxam) to develop and implement their own internal procedures to allow continuous improvement of blast impact

management. The blast design must always ensure that control measures for flyrock, vibration, wall stability and back-break achieve the performance outputs described in this section.

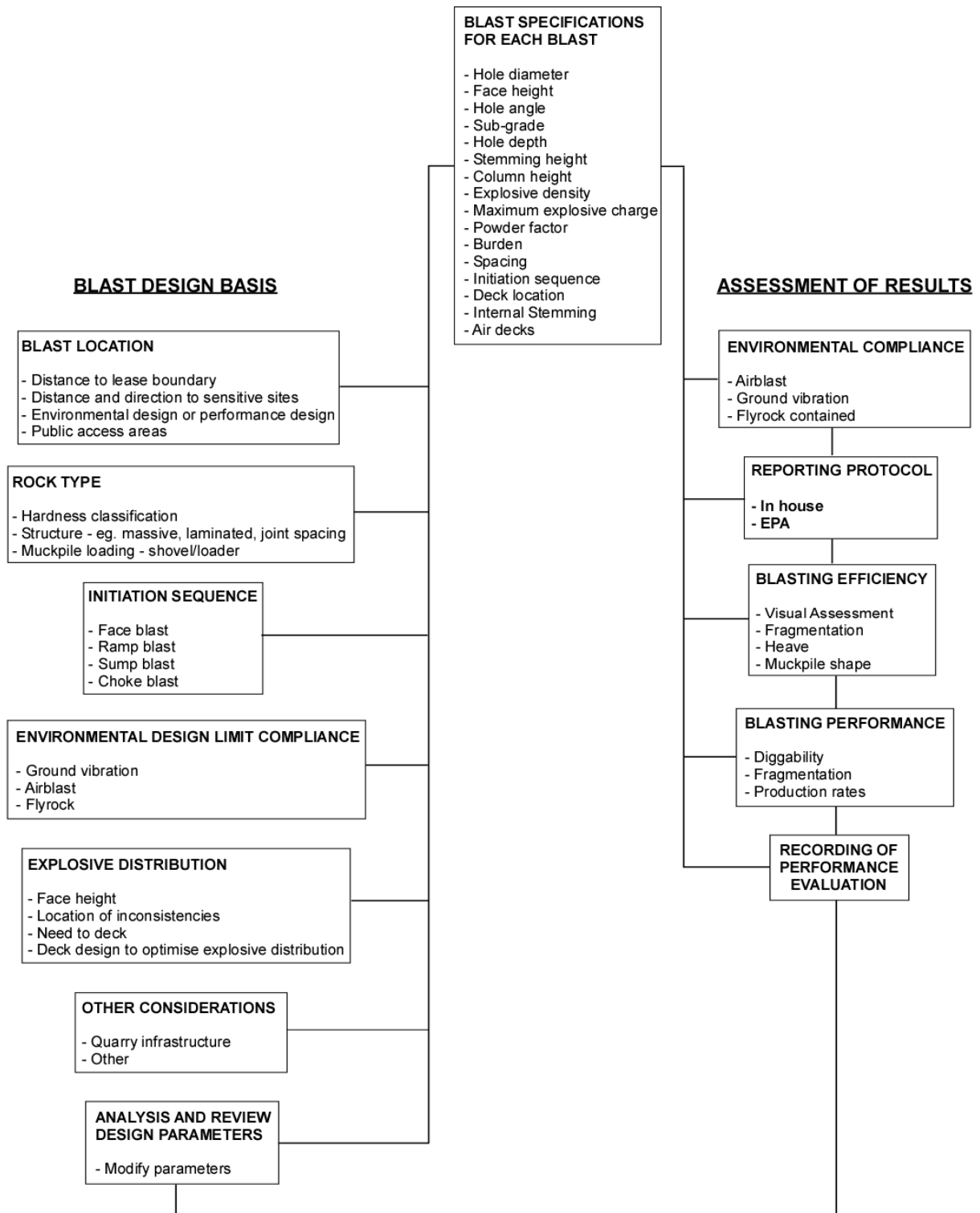


Figure 1 - Environmental Blast Design Flowchart

5.7.1 Control of Flyrock

Controlling flyrock such that there is no significant impact on nationally heritage listed areas or damage or disturbance caused to Aboriginal Heritage Sites is an essential part of the continuing operation of the Nickol Bay Quarry.

It is recommended the following minimum requirements for drill hole diameter, explosives charge, stemming height and front row burden must be met during blast design and hole loading at different distances from a nationally heritage listed area or Aboriginal Heritage until the blasting contractor (Maxam) can establish their own performance criteria to achieve appropriate flyrock control.

Specifications	26.5m to boundary	15m to boundary	10m to boundary
Drill Hole Diameter	102mm	102mm	102mm
Explosive Charge	10.6kg/m	10.6kg/m	10.6kg/m
Min. Stemming Height	3.5m	4.0m	4.1m
Front Row Burden	4.0m	4.0m	4.0m

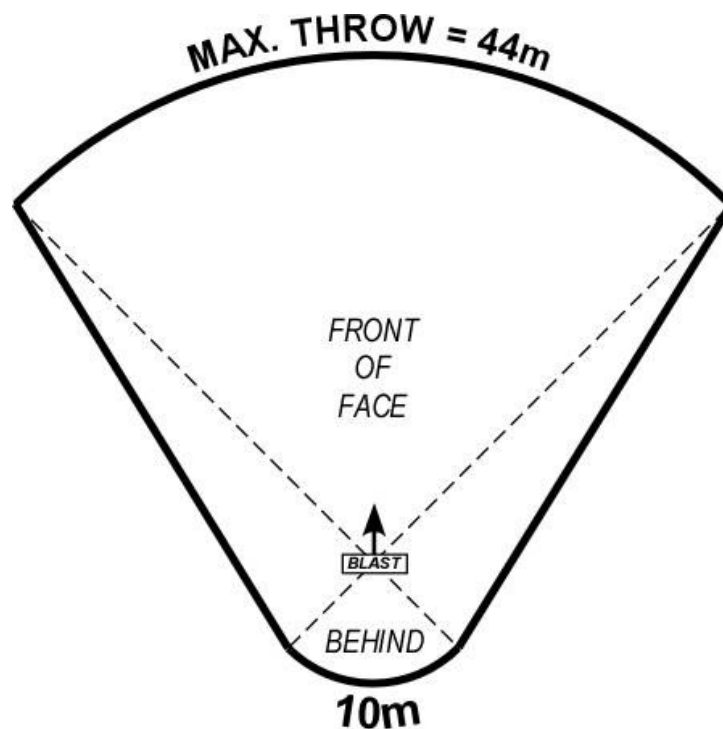


Figure 2 - Buffer distances to be applied from National heritage listed areas and Aboriginal Heritage Sites to avoid any impacts from flyrock

To limit the possibility of damage to nationally heritage listed areas or Aboriginal Heritage Sites from flyrock, blasts shall face away from the nationally heritage listed areas or Aboriginal Heritage Sites.

To assist the Shotfirer in limiting fly rock at different distances from the boundary, Figures 3 & 4 have been produced and shall be used to determine the minimum burden and stemming heights required. An example is provided for each figure.

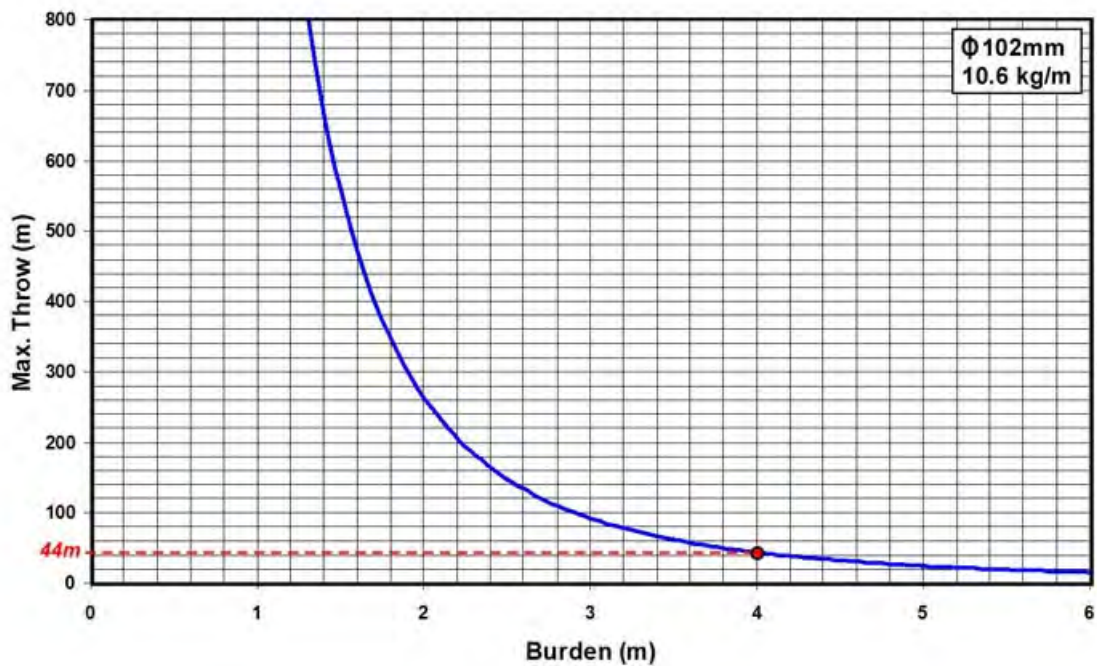


Figure 3: Maximum Throw vs. Burden

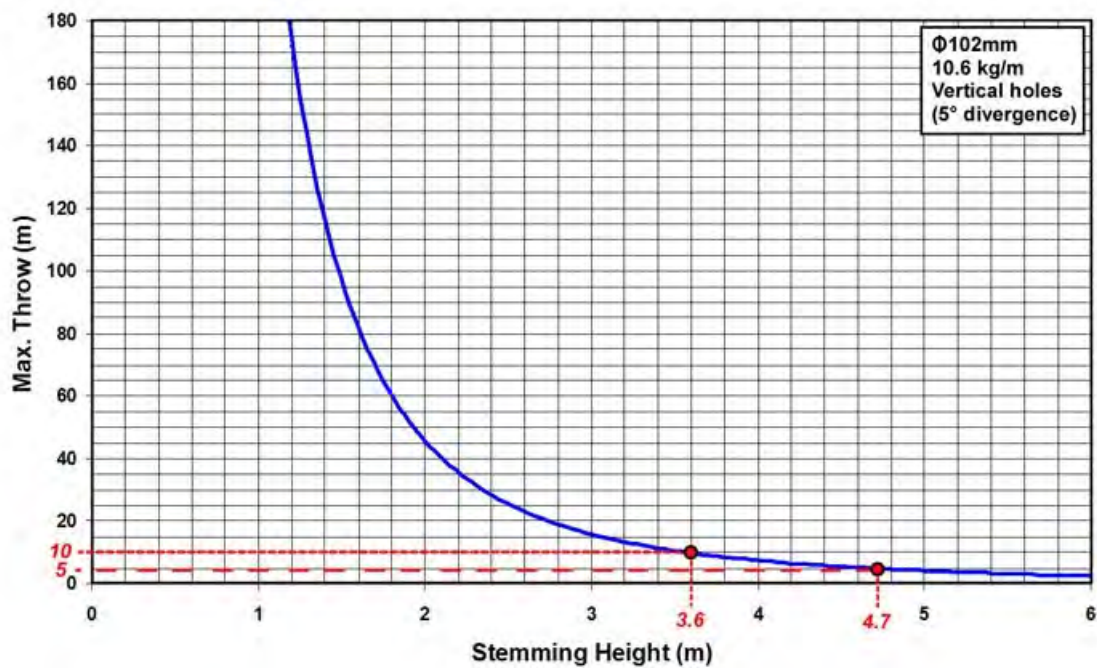


Figure 4: Maximum Throw vs. Stemming Height

5.7.1.1 Example of Determining Minimum Burden Requirement

Distance to the boundary/heritage Area/Aboriginal Heritage Site in front of blast = 120m

Apply Safety Factor of 2 ∴ Maximum throw = 60m

Using the Graph, the minimum burden = 3.5m

5.7.1.2 Example of Determining Minimum Stemming Height

Distance to the boundary/Heritage Area/Aboriginal Heritage Site in front of blast = 20m

Apply Safety Factor of 2 ∴ Maximum throw = 10m

Using the Graph, the minimum stemming height = 3.6m

5.7.1.3 Recording Hole Stemming and Loading Practice

Flyrock throw is limited by the confinement of the explosion by either burden or stemming. An inadvertent lapse by a person on the bench assisting with the loading of only one blast hole can cause fly rock to be projected distances well beyond those planned.

As such to increase the awareness of loading personnel to the importance of loading and to ensure flyrock is minimized, the Explosive/Stemming Loading Checklist (Appendix 7) shall be completed as blast faces approach within 20m of the boundary, a nationally heritage listed area or Aboriginal Heritage Site at the same elevation. One person in the loading crew shall be responsible for:

- Recording the addition of explosive additional to the design loading for each hole.
- Dipping and recording the top of the explosive column below the collar before stemming material is added.
- Marking overloaded holes and drawing them to the attention of the Shotfirer.
- Recording the quantity of stemming added to each hole, marking under-stemmed holes and drawing them to the attention of the Shotfirer. Noting the number of buckets of stemming loaded may be sufficient to warn of bridged stemming.
- Sign off that the holes were loaded according to the design and report any variations or inconsistencies.

5.7.1.4 Model Calibration

To allow for the continued calibration of the predictive models used to make Figures 3 & 4, all blast events shall be videoed in such a manner that if any flyrock was projected behind the blast then it can be observed. The distance from the blast to any flyrock and the size of the flyrock shall be recorded in the blast report for later analysis and cross checking.

5.7.2 Control of Wall Stability

Modelling of blast events at the Nickol Bay Quarry predicts that for fully loaded blastholes there will be no damage to wall stability beyond 18m from the nearest blasthole and that partially loosened rocks will be shaken loose to about 8-10m from the nearest blast hole.

Therefore, to limit the possibility of creating unstable walls in proximity to nationally heritage listed areas or Aboriginal Heritage Sites, a buffer distance of 26.5m for fully loaded top bench blastholes to nationally heritage listed areas and cultural heritage sites shall be applied. At distances between 26.5 and 10m to the boundary, controlled perimeter blasting will be conducted to reduce ground vibration, improve face stability and limit flyrock to the distance to the boundary. The ultimate wall cross section is shown in Figure 5.

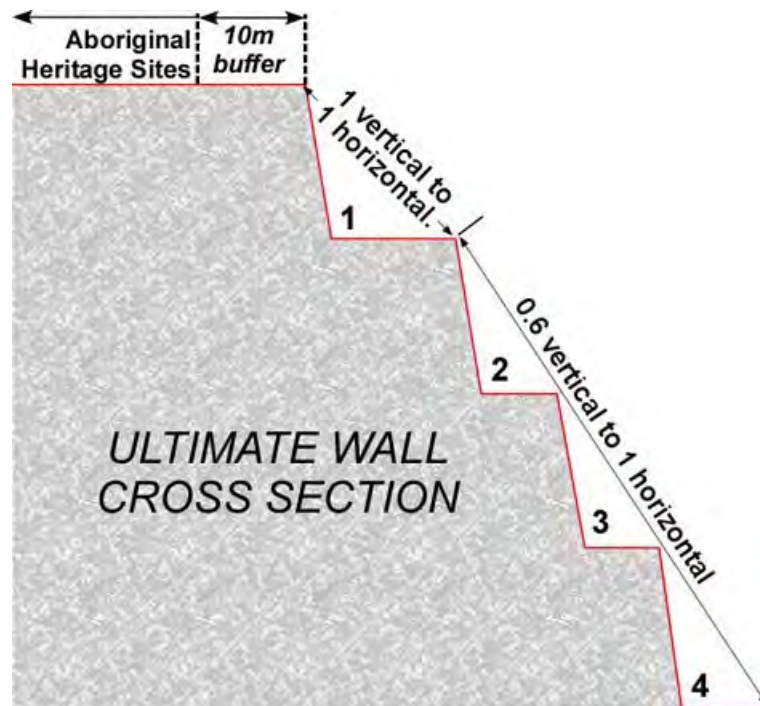


Figure 5 - Buffer distance from top bench wall to Aboriginal Heritage Sites

If lightly loaded perimeter holes do not form a stable crest, loose boulders and overhangs shall be removed by a final trim pass with an excavator.

5.7.2.1 Face Damage Observation

Video recording shall also be used to allow for the continued calibration of the predictive model used to predict the face stability.

5.7.3 Control of Vibration

Vibration on the terminal faces and face stability adjacent to nationally heritage listed areas and Aboriginal Heritage Sites shall be further reduced by the perimeter control blasting schematically shown in Figure 6.

In blast holes closer than 26.5m to the boundary, a reduction in charge mass will be achieved by splitting the explosive charge with an inert deck between. In the perimeter blastholes, an air deck above the reduced charge mass will further reduce ground vibration at the tenement boundary.

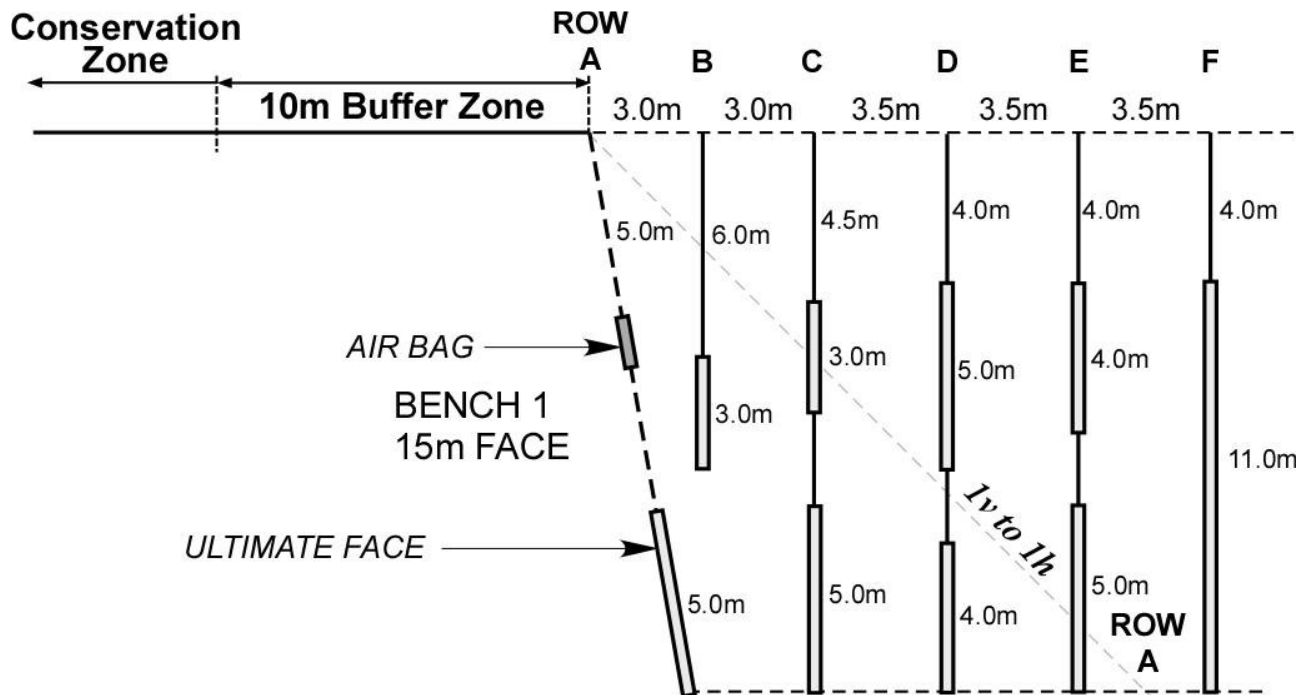


Figure 6: Perimeter hole treatment to further control vibration near nationally heritage listed areas or Aboriginal Heritage Sites.

6. EMERGENCY PROCEDURES

In the event of an emergency during drilling and blasting activities the Nickol Bay Quarry Emergency Response Plan shall be followed (NBQEV001).

7. RECORDS

The following records shall be kept of each blast as a permanent record for later reference and analysis.

Record Name	Location to be kept	Retention Period
Maxam Drill and Blast Shotfirer's Report	Maxam Office	Permanent
Maxam Blast Report	Maxam Office	Permanent
Maxam Timing Plan	Maxam Office	Permanent
Vibration Monitor Wavetrace	Maxam Office	Permanent
Profiles of Front Row blastholes	Maxam Office	Permanent
Profiles of Front Row blastholes-Front View	Maxam Office	Permanent
Video Recording of Blast	Maxam Office	Permanent
Blasting Checklist	Maxam Office	Permanent
Loading Checklist (if closer than 40m to a boundary)	Maxam Office	Permanent
Safe Work Procedure Sign off Sheet	Maxam Office	Permanent
Job Safety Analysis Worksheets for increased risk incidents (such as misfire treatment, bridged stemming).	Maxam Office	Permanent



APPENDICES

APPENDIX 1.1 - Holcim (Australia) Pty Ltd Safety, Health & Environment Guiding Principles



Strength. Performance. Passion.

Safety, Health and Environment Guiding Principles

Holcim (Australia) Pty Ltd, 09/2009

These ten principles should guide the development of strategic plans and management systems within the corporation. They provide direction when there are questions regarding the appropriate manner in which safety and health should be managed.

- All Injuries, occupational illnesses and environmental incidents are preventable.
- All individuals (employees, managers and contractors) must be held accountable for their safety, health and environmental performance.
- Working safely in regard for the environment is a condition of employment.
- Error is a consequence and opportunity, not a cause.
- Communication and consultation with employees is critical to effective management system.
- Focus on the management system and unsafe behaviour, a reduction in all incidents will follow.
- Unsafe behaviour is the primary trigger of most injuries and must be addressed accordingly.
- Interaction between people and equipment creates risk requiring constant vigilance.
- The community (with includes all stakeholders) provides us with the right to operate.
- Keep the SHE management system as simple as possible.



Peter James
CEO, Holcim (Australia) Pty Ltd

APPENDIX 1.2 - Holcim (Australia) Pty Ltd Environmental Policy



Strength. Performance. Passion.

Environmental Policy

Holcim (Australia) Pty Ltd, 09/2009

Holcim Australia believes that protecting the environment is integral to sustainable development. Sustainable development represents the balance between economic development, environmental protection and social responsibility. In keeping with its commitment to sustainable development, Holcim Australia will:

- Comply with all applicable environmental laws, regulations, codes of practice and voluntary agreements;
- Minimise the environmental impacts of its operations;
- Operate as an environmentally and socially responsible neighbour;
- Adopt and enforce internal standards that ensure continuous environmental improvement;
- Maintain effective communication channels with employees and the community in relation to environmental matters;
- Provide the necessary resources for training employees in their environmental responsibilities;
- Rehabilitate land that is impacted by its activities;
- Ensure energy efficiency, optimum use of raw materials and the reduction of waste in all operations;
- Respond to the challenges presented by climate change by identifying opportunities to reduce its carbon footprint.

Wherever possible, Holcim Australia will strive to identify and implement operational improvements that will enhance its environmental performance and sustainability practices.



Peter James
CEO, Holcim (Australia) Pty Ltd

*APPENDIX 1.3 - Holcim (Australia) Pty Ltd Safety, Health and Environment
Management Directives*



Strength. Performance. Passion.

Safety, Health and Environment Management Directives

Holcim (Australia) Pty Ltd, 09/2009

These ten directives are to be understood and observed by all Holcim and Humes management personnel, regardless of title or area of responsibility. These represent the specific expectations of the CEO and should be followed closely.

- Ensure that safe and environmentally sound production is never compromised.
- Develop and actively manage a SHE plan for all sites or cells.
- Ensure all employees, visitors and contractors are effectively trained and educated.
- Identify, assess and control SHE hazards.
- Use individual and group meetings to communicate and consult on SHE issues.
- Report and investigate all incidents and implement timely corrective action based on root cause.
- Recognise employees for their positive SHE contributions.
- Ensure employees, whether operations, administration or support, understand their SHE responsibilities and are held accountable for the same.
- Use incident rates and lead indicators to evaluate and manage safety, health and environment.
- Conduct operations with regard for the communities in which we operate.



Peter James
CEO, Holcim (Australia) Pty Ltd

APPENDIX 1.4 - Holcim (Australia) Pty Ltd Safety and Health (SHE) Policy



Strength Performance Passion

Safety and Health Policy

Holcim (Australia) Pty Ltd, 09/2009

Holcim (Australia) recognises the importance of providing all employees, contractors, labour hire employees and visitors with a safe and healthy work environment.

Our goal is the elimination of all injuries, occupational illnesses and preventable vehicular incidents.

The company will seek to achieve this by:

- Identifying and reducing the risks of all types of work activities that have the potential to produce personal injury or occupational illness;
- Ensuring that everyone (including visitors and contractors) complies with appropriate legal and workplace requirements relating to safety and health;
- Establishing measurable objectives and targets for Safety, and Health to ensure continuous improvement aimed at elimination of work related illness and injury;
- Providing instruction, training and supervision to improve individual's understanding of workplace hazards, including safe work practices and emergency procedures;
- Involving individual's in safety and health matters within the workplace, and consulting with them in ways to recognise, evaluate and control workplace hazards via the risk management process;
- Communicating safety and health information to all employees, contractors, labour hire employees and visitors to the workplace;

Effectively implementing the S&H Policy



Peter James
CEO, Holcim (Australia) Pty Ltd

APPENDIX 2 - SHE Guideline 3.18: Responsibilities and Actions Matrix

Attachment 3.18B

Legend

Abbrev.	Description	Abbrev.	Description
QM	Quarry Manager	C	Contractor: CD - Contractor – Drilling CE - Contractor – Explosives Supply CS - Contractor – Face Surveyor CV - Contractor – Vibration Monitoring CT – Contractor – Technical Services
SF	Certified Shotfirer (may be quarry personnel or contractor)		
S	Weighbridge Operator/Siren Operator		
D	Decision	L	Loading Crew (may be quarry personnel or contractor):
A	Approval necessary		
?	Action by		

Activity	Action by				
	QM	SF	L	C	S
Blast Design and Layout					
• Need to blast/decide blast location.	D				
• Visually assess face	?	?			
• Prepare blast site, access and bunding for drill rig.	?				
• Face profiling, hole design, hole layout.	A	?		CS	
Drill Blast Holes					
• Holes drilled to design (record any unusual events during the drilling such as; cavities, soft rock, inability to drill holes in accordance with plan, etc).				CD	
• Front row bore tracked.				CS	
• Hole profiles produced and reviewed	A	?		CS	
• Redrill, if required.				CD	
• Install edge protection barrier		?			
• Inspect face from floor and note face weaknesses, shattered ground on profiles.	?	?			
• Check hole depths	?	?			
• Review Drillers log	?	?			
Design Blast And Source Explosives					
• Hole loading design and review.	A	A		CT	
• Prepare hole loading chart.	A	A		CT	
• Initiation sequence design.	A	A		CT	
• Determine quantities of explosives and detonators.		A		CT	
• Notify vibration monitoring contractor of shot time and monitoring locations.	?	?		CV	
• Check site access for contractor explosive's truck	?	?			
• Check exploder is operational		?			
• Check weather forecast.	?	?			
Day Of Blast - Preliminaries					
• Observe weather conditions.	?	?			
• Decide to proceed with blast.	D	?			

Attachment 3-18B

Activity	Action by				
	QM	SF	L	C	S
• Notify neighbours.	?	?			
• Place advisory signs.	?	?			
• Place stemming material near blast holes.	?	?			
• Remove all unnecessary machinery from blast area.	?	?			
• Display blasting time.	?	?			
• Check weather forecast. Quarry Manager to sign Risk Assessment before loading the shot.	?	?			
Loading Explosives					
• Ensure no other quarry activities are occurring or can occur on the bench above or below the blasting activities	?	?			
• Remove explosives from magazine; transport to site (Explosives should be issued in the order of date of manufacture so that the older explosives are issued first)		?	?		
• Contractor explosive's truck arrives at Quarry; Contractors sign in and proceed to blast site.			?	CE	
• Lay out boosters and down hole detonators (keep 1 metre apart, do not drop or throw)		?	?		
• Check hole depths and record.		?	?		
• Make up primers; lower booster down hole; secure lead lines at surface.		?	?		
• Determine hole charge from hole depth and density of product plus minimum stemming height.		?	?		
• Commence loading and lift primer from bottom.		?	?	CE	
• Ensure column rises – be aware of the possibility of cavities – especially in front row holes.		?	?	CE	
• Stop loading at required delivery count and stemming height (mark on hose) or top up to required stemming height – systematically load all blast holes		?	?	CE	
• When loading complete, the Contractors clean up the bulk tanker, weigh out and sign out.			?	CE	
• Check explosive loading log (including densities)		?			
• Connect up surface detonators, commencing with echelon rows with control row last.		?	?		
• Return excess explosives and detonators to the magazines (count stock and record).		?	?		
• Ensure loaded shot holes are constantly supervised					
• Remove edge protection barrier		?			
Firing the Blast					
• Exploder is taken to the initiation point, decided prior the shot.		?			
• Decide time of blast.		D			
• Advise Blast Controller and Weighbridge Operator (for sirens).	?	?			?
• Clear workforce and machinery to safe location.	?	?			
• Place guards to prevent unauthorised access.	?	?			

Attachment 3.18B

Activity	Action by				
	QM	SF	L	C	S
<ul style="list-style-type: none"> Walk the shot to check that all holes have been tied in and that the sequence is correct. 		?			
<ul style="list-style-type: none"> Clip LIL to Initiation point. 		?			
<ul style="list-style-type: none"> Run out LIL to Firing point 		?			
<ul style="list-style-type: none"> Check by radio that control points are secure. 	?	?			
<ul style="list-style-type: none"> When the dust and fumes have cleared, the blast is inspected for signs of a misfire 		?			
<ul style="list-style-type: none"> If all holes have fired, the "ALL CLEAR" is given 		?			
After The "All Clear"					
<ul style="list-style-type: none"> Guards or sentries stand down and quarry operation returns to normal. 	?	?			
<ul style="list-style-type: none"> The floor is swept before trucks enter the loading area. 		?			
<ul style="list-style-type: none"> The firing cable is wound up, the exploder and handle are returned to the office. 		?			
<ul style="list-style-type: none"> The Blasting Report is made and stock record and Shotfirer's Report completed. 	A	?			
<ul style="list-style-type: none"> Video of blast is viewed. 	?	?		CV	
<ul style="list-style-type: none"> Vibration results are reviewed and entered in Manager's Report, pending full report. 	?	?		CV	
<ul style="list-style-type: none"> Blast Vibration Report prepared and sent to Quarry. 	?	?		CV	
Precautions When A Storm Approaches					
If an electrical storm, thunder storm or dust storm approaches a shot during loading, the Shotfirer must:					
<ul style="list-style-type: none"> If loading can be completed and the shot fired before the storm comes dangerously close then fire the shot. 		?			
<ul style="list-style-type: none"> If loading cannot be completed then make all circuits safe; collect and return all unloaded explosives to the magazine; withdraw all persons to a safe distance from the blast or any explosive in the course of transportation. 		?			
<ul style="list-style-type: none"> Keep the blast site under observation from a safe place until the storm passes. 		?			
<ul style="list-style-type: none"> No person to return to the magazine until the shotfirer determines it is safe to do so. 		?			
Dealing With Misfires					
<ul style="list-style-type: none"> Establish cause of misfire. 	?	?			
<ul style="list-style-type: none"> Treat misfire as per approved manner 	?	?			
Transporting Explosives Around The Quarry					
<ul style="list-style-type: none"> Vehicles used to transport explosives and detonators shall comply with Holcim SHE Guidelines 		?		CE	
<ul style="list-style-type: none"> The driver has a licence to use explosives 		?	?	CE	
<ul style="list-style-type: none"> Explosives shall be transported in Explosive Receptacles complying with Holcim SHE Guidelines 		?	?	CE	
Theft Of Explosives					

Attachment 3.18B

<ul style="list-style-type: none"> • Theft of explosive or any unaccountable stock shortages shall be reported appropriately. Explosives shall be regarded as accountable items and any evidence of attempted forced entry to, or theft of explosives from, a magazine or an unaccountable stock discrepancy shall be immediately reported in accordance with the relevant legislation, to the regulatory authority and the police. The records shall be readily available to permit the determination of the type and quantity of missing explosive. 			CE	
<p>Fire</p>				
<p>If a small fire occurs in the magazine are then-</p> <ul style="list-style-type: none"> • Small fires can be tackled with a fire extinguisher. • If the fire persists after using the fire extinguisher then follow the procedure for bushfire. 	?			
<p>If a bushfire threatens an area containing an magazine then—</p> <ul style="list-style-type: none"> • any explosives or detonators situated outside shall be promptly placed inside the magazine or removed to a safe location; • the magazine shall be closed and locked; • every person shall be withdrawn to a designated safe area prior to the arrival of the bushfire; • the person in charge of the magazine shall be available to advise and assist the local firefighting authority; and • no person shall return to the external magazine until a competent person determines that it is safe to do so. <p>Due to the considerable risk to firefighters, fires in proximity to magazines or within magazines should not be fought, all personnel should be removed to a safe location and access to the magazine secured.</p>				



HOLCIM NICKOL BAY QUARRY BLAST MANAGEMENT PLAN

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APPENDIX 3.1 - Maxam Tech Service Survey Risk Assessment



Technical Services Survey & Risk Assessment Job Sheet

U-Safe Form 4-2-07.2

Revision #3 October 2008

Part 1 – RISK ASSESSMENT			Part 2 – JOB SHEET				
Customer Name / Site Location:			DATE:		Maxam File Reference:		
BLAST I.D.:		Name of Site Contact:		Blast Description and Location:			
<input type="checkbox"/> = Identification Of Risk, Remedial action required			YES	NO	TIME JOB STARTED:	TIME JOB FINISHED:	
Have all Maxam personnel involved in work completed a Site Induction?			Blast Design Hazard ID		Parameters	This Blast	Last Blast
Is Bench Access suitable for Drills, Light Vehicles and MSU? Comments:			Are Ground Conditions <input type="checkbox"/> Hard <input type="checkbox"/> Fractured <input type="checkbox"/> Soft <input type="checkbox"/> Highly Jointed <input type="checkbox"/> Pre-conditioned		Burden		
Slip/ Trip/ Fall Hazards on Blast Area? Comments:			How will these ground conditions affect the blast design (Describe)?		Minimum Front Burden		
Are the High Walls above the Blast Area stable (no overhangs / loose rocks / Back Breaks etc)? Have Machinery Operators (drillers, diggers etc) been advised of your presence in their work areas?					Spacing		
Are you familiar with previous Blast Parameters used on this site?					Approximate Bench Height		
Are any changes to past blast designs required for this blast?			What are the Environmental Restrictions?		Number of Rows		
Have Blast Parameters and recognized risks been discussed with the Site Manager or delegate? Comments:			<input type="checkbox"/> Vibration Limits _____ <input type="checkbox"/> Air blast _____		Bench Length		
Is there any toe or materials on the face that will obstruct profiling?			What Explosive Density will be used?		Sub drill		
Will you be required to work within 2 meters of the exposed edge without any edge protection?			What is the stemming height?		Hole Size / Column Inclusion		
Part 1 - Comments / Other Risk Identified, Methods of Risk Control Used:			Part 2 Comments				
Signature of Site Manager:			Signature of Maxam Technical services Rep:		Signature of Business Manager:		



HOLCIM NICKOL BAY QUARRY BLAST MANAGEMENT PLAN

JAN 10 (Amended)
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APPENDIX 3.2 - Maxam Blast Risk Assessment

Blast Risk Assessment U-Safe Form 4-1-05.1	Rev # 4 April 09	Customer _____ Site _____ Designed By _____ Date _____ Designed Tonnes of Explosives _____ Designed Powder Factor _____ Shot Firer _____ Cart Note # _____ Shot ID _____																																																																																																																																	
Time Start _____ Finish _____																																																																																																																																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">GENERAL</th> <th style="width: 10%;">Yes</th> <th style="width: 10%;">No</th> <th style="width: 10%;">Comment</th> <th style="width: 10%;">Responsibility</th> </tr> </thead> <tbody> <tr> <td>Has form # 4-2-07 2 been rec'd?</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Have pre-starts been done on MSU?</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Access to bench / shot adequate?</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>High walls above blast area inspected for loose material? Has the face from below the blast area been inspected?</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Are there any overhangs / protrusions? 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Access to bench / shot adequate?					High walls above blast area inspected for loose material? Has the face from below the blast area been inspected?					Are there any overhangs / protrusions? Is there any loose material near the face?					Is there back break?					Is the ground surface reasonably smooth & clear?					Is the ground sloping?					How many holes are within 2m from the edge? Specify the method of Fall Protection to be used:					Blast Area free of trip hazards?					Ground conditions: Wet / muddy / dry / dusty Duties / Tasks known & communicated to all Blast Crew?					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<p>Blast Time..... All questions should be answered. All Crew shall sign form.</p> <p>Shot Firer's Name _____ Shot Firer's Signature _____</p> <p>Crew Signatures: 1) _____ 2) _____</p> <p>3) _____ 4) _____ 5) _____</p> <p>PRE-INITIATION Prior to Initiating Blast the Shot Firer must answer the following Questions & Sign Off.</p> <ol style="list-style-type: none"> Were any holes over filled? Yes / No Has any "Product Slumping" been noticed? Yes / No Have any deviations from Blast Plan been noted? Yes / No If yes SSB/OM to initial. <p>Shot Firer's Signature _____</p>																																																																																																																																			

APPENDIX 4 - Maxam Drill & Blast Procedures

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Definitions / Forms

These following terms are used within this procedure:

Maxam Supervisor

Rock on Ground Services: This is the designated shotfirer. In cases where the Business Manager or Drill and Blast Superintendent are in attendance, they assume overall responsibility for providing supervision over Maxam Work Practices.

Down Hole Services: Although the designated shotfirer may not be a Maxam employee, they have statutory responsibility for directing how blast holes are loaded. They are not responsible for directing and supervising Maxam equipment or work practices. The senior Maxam employee present, or the person delegated by the Business Manager or Drill and Blast Superintendent, is the person designated as the supervisor and shall take responsibility for all Maxam equipment and work practices. In these circumstances the supervisor may or may not hold a shotfirer competency. They will hold a minimum competency of Maxam (uTrain) Unit 2.

Authorised Employee: Will (nominally) be the person defined as "Supervisor". The "Authorised Employee" is the person designated to exercise control over Security Sensitive Ammonium Nitrate (SSAN).

The following "uSafe" Documents are referred to in this procedure

- Document #4-3-01.1 - Drill Log
- Document #4-3-01.2 - Bulk Explosive Load Log
- Document #4-3-01.3 - Site Blast Parameters Worksheet
- Document #4-1-05.1 - Blast Risk Assessment
- Document #4-2-07.2 - Technical Services Field Report / Risk Assessment
- Document # 3-01-3 - UNI Tronic Electronic Blasting System

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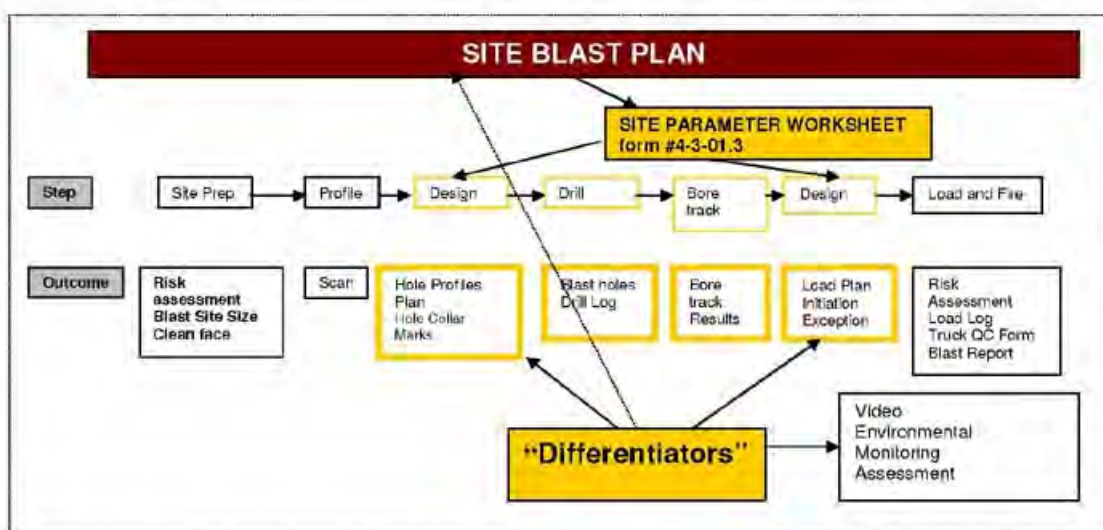
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1.0 Introduction

The flow chart below, (figure 1) shows the process for the delivery of Drill and Blast services. Successful Drill and Blast outcomes depend upon good design, auditing of design and the accurate application of explosives.

Figure 1 – Diagrammatic representation of Maxam Drill and Blast services



1.2 Overview of process

The services delivered by Maxam fall into three main categories. They are:

1. Rock On Ground
2. Down Hole Services – Delivery of product (may include accessories) only, no shot firing services conducted, and
3. Supply of explosive (class 1 and class 5) products only.

This procedure applies to Rock on Ground and Down Hole Services only. A summary description is provided below.

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1.2.1 Rock On Ground

Rock on Ground Services: Is a service where all activities relating to providing blasted rock to a client are contracted by Maxam. This includes:

- Blast design (applying Technical Services), laser profiling, blast mark-up
- Drilling (sub contracted)
- Auditing of Drilling (bore tracking)
- Application and initiation of explosives

A Rock on Ground service may include all of the above, excluding drilling services. Some clients may provide drilling services as a part of a Rock on Ground service.

For Rock on ground applications, Maxam has total control over all aspects of the Drill and blast operation.

1.2.2 Down Hole Services

Down Hole Service: Is any service other than that detailed above (1.2.1). It may include variations and differing degrees of service. Down hole services do not include shot firing activities. Down Hole services may include:

- Supply of bulk product only
- Supply of explosive accessories and bulk product
- Supply of bulk product, accessories and blast design services

Not all aspects of this procedure will apply to circumstances where Maxam are delivering down Hole Services, as Maxam is not in a position to exercise control over some of these practices. However, the intent must be to implement the requirements of this procedure to the fullest possible extent.

1.3 Maxam Required Service Parameters

No staff member or contractor employed by Maxam will perform shotfiring activities where laser profiling and bore tracking have not been performed. ⁽¹⁾

Where Maxam has delivered laser profiling as a part of blast design services, bore tracking must be completed, regardless of the party assuming shotfiring duties. Blast design services can not be segregated. If a blast is to be designed by Maxam it is to include laser profiling and bore tracking. Results must be effectively communicated (in writing) to the designated shotfirer.

Mobile telephones are not to be used while on a shot bench.

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PART 2 – BLAST DESIGN

The following responsibilities are allocated for the designing of blasts and communication of blast design Audit results (Bore Tracking).

Responsibilities

2.1 Maxam Business Managers (and/or) Drill and Blast Superintendents

They are responsible for ensuring that correct process is followed for the design of blasts and the communication of results from blast design auditing (bore tracking), specifically they shall monitor and check to ensure that:

1. Blast Parameter sheets (see form# 4-3-01.3) are completed and updated for all Rock on Ground services and all services where Maxam performs shot design. A copy of all new and updated forms #4-3-01.3 are held locally with Business Managers and an "e-mailed" copy sent to the Maxam Blasting Engineer.
2. Blast parameter sheets are reviewed by the Technical Services Officer when designing blasts or changing parameters.
3. Maxam Technical Services Officers complete form # 4-2-07.2 "Technical services field reports" (fully) for all jobs.
4. Blast Design parameters are adequately audited and all results are effectively and clearly communicated to the shottirer, and
5. Technical Services Officers and shottirers communicate clearly and effectively.

2.2 Technical Services staff

All Technical Services Officers must conduct activities in accordance with uSafe standard 2-07-0. Specifically technical services officers must:

1. Contribute to the development and updating of site "Blast Parameter Sheets (form # 4-3-01.3).
2. Consult Blast parameter worksheets when designing blasts, and
3. Discuss difficult or extraordinary blast design requirements with their respective Business Managers and Shottirers.

2.3 Shottirer

The shottirer must be familiar with the designed blast parameters and the results of blast design auditing (bore tracking). A copy of bore tracking results must be reviewed by the shottirer prior to blast hole loading and be available on the blast at all times during blast preparation. This documentation shall be shown to the customer site representatives prior to loading and be available upon request.

The shottirer must clearly identify any short, collapsed or extraordinary holes and clearly communicate these to the shot loading crew.

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2.4 Method

Drill and Blast planning is a team effort. Not all blasting activities on sites require that all steps of this procedure be followed in detail. However, the intent of the procedure needs to be demonstrated for all blast design activities.

Design and Plans

1. All drill and blast plans should be developed by the technical service officers in consultation with the shot firer and/or customer delegate. Plans shall be completed in a timely manner.
2. The Drill and Blast design should include all of the following:
 - Details from the blast parameter sheets that have been agreed to by the customer's delegate. See form # 4-3-01.3.
 - Face Profiles of all blast holes on front or side free faces, indicating designed burdens.
 - A Drill Plan showing blast hole location, blast hole depth, blast hole size and inclination.
 - Bore track results of blast holes on front and side free faces indicating actual burdens after drilling.
 - A Drill Log completed by driller noting any deviations or specific ground conditions (eg broken or soft ground).
 - A Load Plan showing hole depth, explosive deck amounts and inert deck lengths, stemming lengths and any other relevant hole information, and
 - A "Tie-up" plan showing all surface delays and timing to be used. It may not be necessary to develop "tie-up" plans for some Down Hole Services however, records of tie-up designs should be sought by Maxam where blast design services have been delivered.

2.5 Scheduling

Maxam staff will only accept confirmation of orders for all activities and delivery of product from the principle customer, no orders from third parties (eg contract shot firers) will be accepted.

It is the responsibility of all personnel, Maxam and Customer, to ensure that there is adequate time to conduct all phases of the drill and blast operation.

This includes in particular:

1. Design and provision of plans.
2. Provision of a safe and adequate access for survey vehicles, drill rigs and blast equipment.

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3. Face Profiling.
4. Drilling.
5. Bore tracking.
6. Loading.
7. Firing.
8. Post Blast assessment.

The customer, Technical Service Officer and Blast Supervisor need to work closely to ensure that all stakeholders have adequate notice and that each stakeholder has sufficient time to meet their respective requirements.

PART 3 – Blast Set-up

The following responsibilities are allocated to persons involved in Blast "set-up:"

3.1 Shotfirer

The shotfirer is responsible for all activity within the blast area. He/she is responsible for liaising with the Customer representative to ensure the safety of personnel and equipment that may be affected by the blasting activity. Shotfirers exercising "Authorised Employee" duties shall have the right to reduce the number of persons on a blast to a level where they are able to provide adequate supervision to persons working without unrestricted access to Security Sensitive Ammonium Nitrate. The Shotfirer is responsible for ensuring that the blast area is correctly identified and demarcated to prevent unauthorised entry of persons and vehicles. The shotfirer will record all unauthorised entries on a HIAS report.

3.2 Field Operators (others)

All persons working on a blast must obey directions provided by the designated shot firer / supervisor / or designated "Authorised Employee".

Method


3.3 Risk Assessment

Conducting a Blast Risk Assessment shows that the persons involved in blasting activities discussed particular risks and hazard mitigation measures prior to commencing work activities. The following apply to practice of conducting blast risk assessments:

1. Before work is carried out on the blast a risk assessment (see uSafe 1-05, # 4-1-05.1) will be conducted. All people involved in blasting activities are to participate in the risk assessment process.
2. If at any stage of the blasting process additional personnel are required to be working within the blast area, they shall be taken through the risk

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assessment by the shotfirer or supervisor prior to their commencement of work.

3. When working within 2 meters of an exposed (open edge), positive fall restraint must be used and a notation made on the blast risk assessment (see uSafe 2-02-0 "Working at Heights).

3.4 Site Preparation

The following points must be considered during blast preparation:

1. The access road to the blast site needs to be adequate to accommodate Mobile Sensitising Units (MSU's).
2. Before loading the blast the climatic conditions need to be considered. Overcast weather and strong winds are not ideal conditions for blasting as they can raise risk of causing disturbance to neighbours as well as raise risk of incidents on the blast. If possible, postpone the blast until weather conditions are more suitable.
3. Prior to loading any blasts, stemming material must be place in strategic positions on the blast; this is to be coordinated through the customer delegate. The placement of stemming material should be done in conjunction with the shotfirer.
4. Any activities adjacent to the blast area shall require consent from the shotfirer. This area should be defined in consultation with the Customer's Delegate. All subsidiary equipment should be removed from the blast preparation area. Accessory utilities and support vehicles must be parked well away from blast loading areas.

3.5 Boundary Protection for Security of Blast Area

This section details the guidelines and requirements necessary in the setting up of blast area demarcation (barricades and signs) for identifying and preventing unauthorised entry into the blast area:

1. All boundary protection is to be in place prior to distributing any explosives onto the shot and commencement of loading.
2. The blast area shall be barricaded by erecting demarcation signs as deemed appropriate by the shot firer in consultation with the customer delegate.
3. The barricades shall be located at least 10 metres from either the closest blast holes to be charged or where explosives are to be mixed.
4. Orange cones are the minimum requirement for a shot barricade. They should be arranged in a row, situated a minimum of ten (10) metres from the closest blast holes to be loaded, with a maximum spacing of ten (10) metres between cones.
5. The use of other soft barriers like bunting or hard barriers like rills or oversize rocks should be considered if blast loading practices are being conducted in high traffic areas.

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6. Barricades shall also be used on all other sides of shots where required, i.e. if it is possible for access of people or equipment from alternate directions.
7. Signs shall be placed at the entrance/s to the shot indicating that loading is taking place. Signs must be white with red writing and state (clearly) that explosives are being used and that access is restricted.
8. Barricades and signs shall only be removed once pre-firing preparations are underway. Generally only those parts that are likely to be damaged from the blast shall be removed.
9. If the barricades are to be used to prevent access onto a hazardous area caused by the blast (i.e. barricades erected until a permanent barricade is created along a newly formed high wall), they are to be left in place then checked after the blast and reassembled if necessary. In this circumstance the shotfirer shall notify the customer's delegate of this hazard to allow them to replace Maxam barricade with their own as soon as possible.

3.5 Rules of Entry to Blast Area

1. No unauthorised entry is permitted into the blast area. The only (automatically) authorised persons shall be the shotfirer and explosive handlers who are currently working on the particular blast, as listed on the blast risk assessment or Maxam Management staff performing training or subsidiary OH&S duties. In all cases persons who are not a part of the nominated blast crew shall report to the shotfirer to allow him to brief them on safety requirements within the blast area.
2. No unauthorised vehicles are permitted within the blast area.
3. No excavating or drill equipment should work within 10 meters of loaded holes (any variation to this shall be subject to a risk review with consideration to the 6 metre minimum of AS 2187.2).
4. No smoking in a shot area, in any explosives vehicle, manufacturing area or within 10 metres of any explosives.

3.6 Blast hole Preparation Prior to Explosive Loading

Prior to loading blast holes with explosives the following must occur:

1. All holes should be measured with a tape measure and compared to bore tracking results or plan. As a minimum requirement all front row holes **MUST** be measured with a tape measure. If bore tracking has been conducted with 72 hours of loading, the measuring (dipping of holes is not required) is not required.
2. NB: It is good practice to use a heavy lead sinker as a weight for the tape measure. Should the weight be lost in a blast hole it is soft enough to go through crushing plants without damaging machinery.
3. Damaged, wet or blocked holes are to be noted and reported to the shotfirer.

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4. All holes must be inspected by walking the blast. 'Hot or reactive' holes shall be identified.
 - A "hot" hole can be defined as a hole with a temperature of 55°C
5. Where down hole services are being delivered, the following must occur:
6. The depth and water level of each blast hole should be measured with a tape measure and recorded on the blast load log prior to loading in cases where dry or packaged product is to be used.
7. All weights used on the measuring tapes shall be non-ferrous metal. The only time that this requirement does not apply is for activities before any explosive is inserted into the blast hole.

PART 4 – LOADING and STEMMING THE BLAST

The following responsibilities are allocated for all blast loading and stemming activities:

4.1 Shotfirer / Maxam Authorised Employee / Supervisor

The shotfirer, supervisor or "Maxam Authorised Employee" is responsible for all activity within the blast area. They are also responsible for liaising with the Customer Representative to ensure the safety of personnel, equipment and security of product.

4.2 Field Operators

All persons who are handling explosives must do so 'under the constant and direct supervision of a shotfirer, a Maxam supervisor or "Authorised Employee". All directions given must be complied with.

Method

4.3 Organisational and Planning Issues

The Shotfirer, Supervisor or "Authorised Employee" shall decide on the method of loading the shot. Influencing factors that shall be considered are:

- Weather
- Dry/wet holes
- Single or multi deck loading
- Number of holes to be loaded between truck moves
- Geology of the blast area
- Presence of out of specification holes
- Timing sequence

Planning of the loading sequence should be completed prior to any loading activities commencing. The load plan which indicates any backfill, decks (inert or air) and stemming lengths shall be made prior to the start of the job. This plan should be written but may be verbal if the complexity of the task is not

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great or the task is familiar to the blast crew. The Shotfirer, Supervisor or Authorised Employee shall be responsible for the load plan and its communication to the blast crew.

1. All persons involved must be made aware of hazards, the method of loading and any unique factors involved with loading the blast. This is to avoid any mistakes or confusion due to lack of knowledge of the situation. These factors shall be covered in the risk assessment conducted prior to work commencing.
2. The shotfirer shall ensure that the necessary explosive products, accessories and equipment are available on the shot in a timely manner.
3. If multi pass loading, decide on how explosives delivery trucks should operate so as to prevent running over or snagging RIOTECH® accessories by delivery hose or delivery truck.

4.4 Backfilling

Backfilling shall be done in strict accordance with the loading plan using appropriate stemming material. Particular points to consider are:

1. Ensure that the 'right' hole is being backfilled.
2. Backfilling operations should be completed prior to the laying out of the accessories.
3. Presence of water. Stemming shall be loaded into a blast hole at a rate which does not facilitate bridging of stemming in blast holes.
4. Any damaged or blocked holes shall be reported to the shotfirer and are to be marked conspicuously to prevent inadvertent loading.

4.5 Distribution of Primers and RIOTECH® MS or LP Detonators

Explosive accessories shall be distributed and placed along side the blast hole collar. The accessories should be placed at the hole collar not "thrown or dropped" from any great distance or height. Do not place them so close to the blast hole collar that the primer or RIOTECH® MS or LP may fall down or be knocked down the blast hole.

IMPORTANT: Ensure that the CORRECT RIOTECH® delays and primers are distributed for deck loading.

1. If deck loading an identifying mark should be made on the RIOTECH® MS or LP leads to allow correct identification when tying up the blast e.g. removing the "J" clip for identification of the top deck.
2. If RIOTECH® MS or LP/Booster is lost:
 - Down the hole -
 - Contact shotfirer to take appropriate action (eg reprime) and to record the loss.
 - Is 'lost' – presume it is buried in blast hole cuttings -

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- Try to clarify that it was not lost down the hole.
- Attempt to locate in drill cuttings by spreading out the cuttings with a non ferrous instrument.
- If absolutely certain that it is not in the cuttings, contact the Shotfirer.
- Reprime the hole and record the loss.

4.6 Priming before loading

Cast Pentolite Primers

1. Blast holes should be double primed where the explosive column length exceeds 12 meters or where circumstances such as broken ground, poor geology or excessive water are evident.
2. Check that any of the explosive accessories are not damaged.
3. Any damaged boosters or RIOTECH® accessories are to be kept for investigation and be reported immediately to the shotfirer. They are not to be used to prime blast holes.
4. Check that the RIOTECH® MS or LP's are of the correct length and delay.
5. The detonator must be threaded into the primer so that the signal tube passes through the tunnel and the detonator faces upwards in the detonator well. Tighten the slack in the tubing so that the detonator will not come loose.
6. The primer is then lowered into the bottom of the hole. DO NOT allow the booster to free fall down the hole.

Package Primers


1. The approved "pricker" tool or "spike" should be used to make a hole in the plastic wrapping of the package. The detonator should never be inserted by force into the package explosive.
2. The detonator must be placed into the primer with the detonator pointing upwards. The tubing must then be "clove hitched" around the plug, ensuring that the detonator cannot be pulled out of the plug. The primer is then lowered down the hole. The detonator must be at the bottom of the plug pointing upwards.

4.7 Other Consideration when Priming Blast holes

1. When priming a blast hole look for loose rocks in the collar that may be dislodged in the process of priming, loading or stemming of the blast hole. These rocks shall be removed prior to any explosive being inserted into the blast hole so as to prevent blocking of the blast hole or damage to the RIOTECH® MS or LP leads.
2. The bottom primer assembly is to be raised an appropriate distance off the bottom of the hole to ensure that the bulk explosive product can adequately surround the booster.

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3. The remaining RIOTECH® tube should be wound around a rock, ensuring that it does not fall down the hole. It may be appropriate to mark the blast hole as wet or dry by the way the lead is secured e.g. place the rock on the tube if wet or wrap around the rock if dry. This will assist the explosive operators when loading the explosive in the blast hole.
4. Ensure that the tails of the RIOTECH® accessories are rolled neatly or directed away from the collar so that they are secure on the surface, away from the traffic area and not able to fall down the hole.

4.8 Loading Holes

Some general requirements are:

1. The load plan must be understood by all involved persons in the crew.
2. A systematic, orderly pre-determined sequence to load holes in accordance with load plan must be adopted.
3. The shot shall be loaded such that the holes furthest from the access point are loaded first unless otherwise directed by the shotfirer.
4. Prior to arriving at the quarry or blast location, the truck operator is to ensure that the water tank is either full or empty and that when "weighing on" the truck is in similar condition. The readings from the weighbridge must be recorded on the Cart Note.
5. The explosive operator should start loading explosives in back holes and do a calibration on counts per hole. Once the counts have been established, the counter should be set and worked on automatic mode. (The truck will automatically cut off on the set counts).
6. Holes must be measured ('bobbed') prior to and during the loading process to ensure that:
 - The load plan is being followed.
 - Truck calibration is adequate,
 - The correct collar height is reached.
7. The shotfirer shall ensure that stemming depths will be measured before stemming to ensure that correct quantities of explosives have been loaded. The frequency of checks shall be to a level which satisfies the shotfirer that the blast is being loaded to design and that under or overloaded blast holes are found prior to stemming.
8. To avoid the situation of the pump truck running over holes or running over/caught up with accessories, the pump truck operation shall be in accordance with the agreed loading sequence. This will ensure that the likelihood of running over or snagging down lines is minimised due to a strict adherence to the movement plan. The use of a spotter will be required as necessary – and shall be used at all times if the pump truck is required to reverse within the blast area.

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9. Charging shall be done so as to prevent any damage to the down line/s and excessive spillage around the hole.
10. The hose must be lowered down to the bottom of the hole taking due care not to dislodge rocks, as a small amount of sand or stone landing on top of the primer may decouple the primer from the explosive column.
11. Under no circumstance are any holes to be top loaded.
12. The use of hose guides at the top of the hole should be considered in areas of loose collars where the hose may dislodge material or where damage to the hose may occur.
13. Before slow retraction of the hose is to begin, sufficient Rioflex is to be loaded into the hole to ensure water is displaced at the bottom of the hole. This is done to reduce the risk of a floating booster. Do not pull the hose free from the top of the product in any wet hole. This is to prevent possible inclusion of a water gap in the product.
14. When the hose is 1 metre above the blast hole bottom, the primer should be pulled up into the product by at least 300 mm, ideally at the true grade level.
15. In the case where there may be fractures or bulling in the hole or an incorrect measurement made, on no account should load sheet explosive quantities be exceeded until the shotfirer is consulted. He may revise the loading plan, taking into consideration any MIC limits that may be in effect.
16. If the hole is overcharged, the hole shall be marked and the shotfirer notified.
17. The shotfirer shall assess the blast hole to determine the appropriate course of action. Any overloaded holes should have that explosive removed, hence establishing the correct stemming length. The explosive pump truck should have a PVC pipe with a valve on the end to remove the explosive.
18. If overloading occurs that cannot be rectified, it shall be noted on the shotfirer's report and the customers delegate notified.
19. The product should be regularly sampled for quality and density at a frequency that ensures consistency. Intervals of every 1.0 tonne are required for adequate density control.
20. The top booster should be inserted into the top of the explosives column with the stemming stick when RIOFLEX is used to ensure sufficient cover of the booster with explosives product.
21. The tension on the down lines shall be checked to determine whether the primers are in the product. If this is not the case, more product will be required to cover the primer.

4.9 Waste Management

1. Every effort is to be made to minimise the quantity of wasted RIOFLEX.
2. Each MSU will be calibrated to provide the quantity of RIOFLEX held within the manufacturing and delivery system.

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3. At start up, the wash-in must be deposited on the surface to the back of the shot. This should be watery, non-viable product. Once viable product has been achieved, loading should commence.
4. Finishing holes should be identified and dipped to establish the required quantity of explosive to load these holes. It is advisable to add up to 10% to this figure to allow for run offs etc.
5. Once this figure has been calculated, subtract the quantity of product that is held in the manufacturing & delivery system. The resulting figure is the required quantity to manufacture.
6. The amount can be adjusted as the last holes are loaded dependant on the quantity of RIOFLEX required for each hole.
7. Once the last hole has been loaded, the MSU product line can be flushed with water. If possible, this should be at the same place that the wash-in was conducted. Any residual 'viable product' should be dispersed with water on the surface of the bench.
8. The practice of pumping out over the free face should not be used. There is no means of dispersing the sensitised RIOFLEX. The residual product may not be consumed by the blast. This could constitute loss of chain of custody for SSAN and the abandonment of a class 1.5 Explosive. It can also lead to suggestions that blast holes have not fully initiated, if product is found in/near the muck pile.

4.10 Decking

1. Decking is normally carried out where it is required to have explosives located in certain parts of the hole. This is usually carried out to either:
 - Account for a reduction in burden due to hole deviation.
 - Reduce powder factor.
 - Split holes to reduce MIC.
 - Ensure explosive energy release does not occur in "soft" zones creating airblast.
2. Explosive decks may be of packaged RIOGEL which can be loaded with care in under burdened areas or to "deck out of water". Always take care in areas of under burden to prevent flyrock or air overpressure from face bursts.
3. Ensure that inert decks are of sufficient length to prevent sympathetic initiation from neighbouring explosive decks especially when different delays are used.
4. Establish 'deck/s' by the use of stemming or hole blocker.
5. Ensure that each explosive deck is adequately primed.

4.11 Stemming

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1. Prior to stemming ensure that stemming height has been checked and that the hole is in fact loaded with the entire required explosive product and that the planned collar height has been achieved as per design.
2. Prior to the placement of stemming material the integrity of downlines must be tested, this shall be achieved by applying upward pressure to the shocktube.
3. Holes shall be stemmed once the column height and the integrity of the shocktube have been checked.
4. The method of stemming used shall ensure that the RIOTECH® down line is not damaged.
5. The shotfirer or supervisor shall ensure that the stemming material is of a suitable quality and does not contain large fragments of rock that may bridge across the hole or damage the RIOTECH® down lines.
6. The shotfirer is to be advised if any holes are blocked or if the explosive handler is unsure of the quality or quantity of the stemming material.
7. All loaded holes should be stemmed prior to the tying up of the blast.
8. Particular issues to consider when stemming are:
 - Secure the down lines and, if mechanical devices (shovel, loaders etc) are used, then ensure that they do not come into contact with the RIOTECH® down lines.
 - Observe that the stemming is freely flowing into the hole.
 - The rate of stemming inflow into the blast hole shall be such that "bridging" of the blast hole does not occur.
 - Ensure that any hang ups or blockages are dislodged.
 - A 'fit for purpose' machine or bucket shall be used for stemming.
 - The operator of mechanical stemming devices is to ensure that they approach and work the blast hole from the side opposite the RIOTECH® down lines. A spotter must be used for all mechanical stemming.
9. If slumping occurs, check the tension of the RIOTECH® down lines, slacken if necessary and resecure the RIOTECH® down lines and top up the stemming material at the discretion of the shotfirer.


4.11.1 Detecting "slumping" holes

A slumping hole is one where the column of explosives applied to the hole "slumps" or drops in height during or after loading. Slumping holes are detected by:

1. Noting that one hole will be taking significantly more counts than other holes of the same length.
2. A hole may be bridged, jammed with an obstacle and the hose may not reach the bottom of the hole.
3. The delivery hose may not be marked correctly, the operator may be applying more product than planned into the hole, and

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4. Sometimes (on very long holes) the explosive product may compress; this usually occurs if holes are top loaded.

4.11.2 Managing slumping holes

1. If one hole (of the same length and diameter) is taking a longer time to fill with product, the hose operator must direct that pumping ceases. As a general rule there should be no more than 10 % variance in pump counts between holes of the same length.
2. Where suspect slumping holes are detected it's important to never overfill the hole. Stop and observe the hole. It may be necessary to deck the hole. The shotfirer will advise on the best method of managing a slumped hole.
3. Check for and remove all loose explosives on surface including the cleanup as best as possible of any product spillage.
4. Blocked or short blast holes (not loaded) that may be in the blast area shall be stemmed to eliminate possible venting of explosion gasses during the blast.
5. Tally up explosive accessories to calculate usage.
6. Return unused stock to original manufactures boxes and stow on transport vehicle.

Shotfirer is to fill out cart note with quantities used.

PART 5 – SURFACE TIE UP CONNECTIONS

5.1 Method

1. The tie up shall not commence if there is any doubt that the shot cannot be fired and the post firing inspection adequately carried out during allowable blasting hours. If there is any doubt, the tie up and firing must be postponed until the customer's delegate is informed. It will be at the customer's discretion as to when the blast can be fired, assuming regulatory requirements are still being met. The shotfirer must inform the customer's delegate of any increased risk that may be present by delaying of the blast any further in time.
2. Once the tie-up has started, the shot shall either be continuously attended or other appropriate security arrangements made.
3. The necessity for a full tie-up plan needs to be determined on the basis of shot tie-up complexity and the experience of the persons involved.
4. In certain circumstances, the shotfirer may allow the tying up of the shot to commence while charging and stemming are being completed, however, this is not considered best practice.
5. Ensure that the tie-up process is made as simple and straight forward as possible.

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6. If environmental concerns are evident then consideration to covering of the explosive accessories should be given. Care in ensuring that the no covering material interferes with the surface connections must be made.
7. If "blasting mats" or similar are to be used, then ensure that the process of covering the blast area does not interfere with the surface connections.

5.2 Non-electric Shock Tube Initiation (Non-Electric) System

1. In preparation for the tie-up, the Shotfirer / Supervisor shall organise the following:
 - The correct types and numbers of RIOTECH® TLD surface delays are available.
 - Loading of the shot is complete.
 - Removal of all unnecessary personnel and equipment prior to tying in the shot. This can include the removal of the explosives pump truck, pumps, lighting plants etc from the immediate blast area.
 - That the shot entrance is secure to prevent any vehicles entering.
 - The tie-up plan is discussed with all persons involved in the surface connection process. This will ensure that the tie-up plan and the role of individuals are clearly communicated.
 - RIOTECH® TLD surface delays shall be distributed along side each blast hole.
 - Ensure that the correct RIOTECH® TLD surface delays are distributed by referring to the surface delay colour codes.
 - Any damaged surface connectors are not to be used and shall be reported immediately to the shotfirer.
2. Personnel carrying out the tie-up shall do so in a planned, methodical and approved manner. The preferred system is:
 - Holes are tied systematically from the end of the echelon towards the control row.
 - The shotfirer ties in the control row from the rear of the shot toward the initiation point.
 - Double check that the RIOTECH® TLD surface delay is correct.
 - Connect RIOTECH® TLD surface connectors and RIOTECH® MS or LP down lines in accordance with Maxam requirements.
3. Tails to be laid out in an orderly fashion.
4. Both during the tie-up and subsequent inspection(s), personnel must take particular care not to step on or trip/snag the shock tubing.
5. After the tying up of the shot, the shotfirer and or nominated Explosive Handlers shall check to confirm that all surface connections are tied in correctly and that there are no accessories left on the blast.

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6. Any mistakes found shall be corrected before continuing with the inspection.
7. In the event of a pending electrical storm that may develop during the tie-up process, uSafe 3-02-0 shall apply, actions to be taken include:
 - The shotfirer shall assess the proximity of the storm and make a decision as to whether there is time to fire the shot safely, disconnect the control row tie-up and evacuate the blast area or immediately evacuate the blast area.
 - Clear the area of persons and establish guards at the normal firing safety distance and notify the customer's delegate the action taken.
8. If for any reason it is not possible to fire a shot once it has been 'tied up' or the tie-up has not been completed (say) due to a machinery breakdown, the blast surface connections will be disconnected, then treat as a normal sleeping shot.

5.3 Detonating Cord Initiated System

1. Generally the methodology is common to the non-electric system as outlined above with the differences being:
 - The detonating cord is run out for the entire length of the back and front rows.
 - If delays are used, they shall be connected up in accordance with the tie-up plan.
 - All knots shall be tied in the approved manner as shown in AS 2187.2.
2. Shots may also be tied in before all equipment has left the shot with the following controls in place:
 - A marker shall be placed at each end of the last row to be tied in and a barricade (can be orange cones) is to be erected at a distance of at least 10 metres outside of this.
 - Any mobile equipment shall not enter this area.

5.4 UNI Tronic Electronic Blasting System

Procedure

1. Ensure that scanners and blasting boxes are fully charged and that the network tester is in working order.
2. Prepare a blast design incorporating:
 - hole locations.
 - timing sequence.

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- complete circuit design including wiring diagrams, hardware needs, number and placement of all accessories including Z-Pieces and blasting cables.
- 3. Ensure that required stocks are available for the design.
- 4. Transport blast materials to the blasting site in accordance with applicable regulatory requirements.
- 5. Deploy the detonators, make up primer assemblies and load the blastholes using accepted loading methods (Maxam Drill and Blast Procedures uSafe 3-01-0).
- 6. If damage to a downline is suspected, use the network tester from a distance of a least 10m to check for leakage in the hole.
- 7. Ensure that all previous data has been deleted from the scanner.
- 8. Scanning should follow closely behind loading and stemming tasks.
- 9. As each detonator is scanned, the corresponding hole should be checked off the timing sequence design. This can be used to ensure timing delays are correctly programmed.
- 10. Once all detonators have been scanned, the total number of units scanned must be reconciled against the timing sequence design and stock count.
- 11. The programmed firing timings for the entire blast must be checked by comparison of the scanner listing of detonator delays and the timing sequence design.
- 12. A rigid hook-up order should be followed as per the circuit design.
- 13. Clear the blast site of unnecessary personnel and equipment prior to checking the full detonator circuit.
- 14. Attach the network tester to one of the open ends in the detonator circuit and then, using the network tester, test the hook-up for an open circuit. If a short circuit is detected, a binary search is necessary to find the fault. The blast cannot proceed until the fault has been rectified.
- 15. Attach a continuity piece to one of the open ends in the detonator circuit and then, using the network tester, test the hook-up for continuity. If an open circuit is detected, a binary search is necessary to find the fault. The blast cannot proceed until the fault has been rectified.
- 16. Remove the continuity piece and using the network tester, test the circuit for leakage. If leakage is detected, a binary search is necessary to find the fault. The blast cannot proceed until the fault has been rectified.
- 17. Attach both open ends in the detonator circuit to the network tester and test for reverse polarity. If reverse polarity is detected, a binary search is necessary to find the fault. The blast cannot proceed until the fault has been rectified.
- 18. Prior to hooking the blasting cables to the blast and the blasting box, clear the blast area of personnel and equipment.
- 19. Attach blasting cables to the circuit and retreat to a safe location.
- 20. Test for open circuit, continuity, leakage and reverse polarity at blast box end of blasting cable prior to connection to the blasting box.
- 21. Attach blasting cables to the blasting box and switch on.

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22. Following the commands on the blasting box display panel, dock the scanner and download the scanned data.
23. **At any time during the arming or initiation sequence, you can abort the blast by unplugging the blasting cables from the blasting box and turning the blasting box to the off position. After aborting the blast always wait a minimum of 5 minutes before returning to the blast site.**
24. Fire the blast by depressing the FIRE button, holding it down for between 1 and 2 seconds then releasing.
25. After the blast has been initiated, always wait a minimum of 5 minutes before returning to the blast site to inspect for misfires.
26. Refer to Maxam Drill and Blast Procedure uSafe 3-01-0 for treatment of misfires.

Maintenance

A maintenance schedule as per the manufacturer's recommendation is to be adopted with regard to all hardware associated with the UNI Tronic™ Electronic Blasting system. A copy of the manufacturer's recommendations for maintenance will be attached when available.

- Complete details for the use of UNI Tronic Electronic Blasting System is available in U-Safe document 3-01-3

PART 6 FIRING OF BLASTS

The shotfirer shall assume full control of the shot and blast clearance area and all decisions made within the aforementioned areas after handover of the blast clearance area from the shot controller. The use of a shot controller does not change the role of the shotfirer who has control of the blast setup area from commencement of loading of explosives. As such the shotfirer has ultimate responsibility for establishing and maintaining a safe blast clearance area.

Blast Controller

The blast controller shall ensure that the security cordon around the shot and blast area is secure and that no encroachment of this area occurs. The blast controller shall hand over control of the blast clearance area to the shotfirer once the area is secure. On hand over to the shotfirer the shot controller shall be responsible for reporting any breach of the security cordon to the shotfirer immediately.

At some sites the shotfirer and the blast controller may be one and the same. The use of a blast controller should always be considered where local knowledge of site access by the shotfirer is limited or where multiple blast guards, 3 plus, are required.

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Blast Guards

Persons acting as guards shall have knowledge of and understand the communication system and blocking procedure for the firing of shots. They have the following responsibility:

1. Act as a guard to prevent persons entering the perimeter of the restricted blast area.
2. Ensure that there is a process of clear understanding of where the Blast Controller wishes them to check for persons within the danger area and prevent entry of people into that area once blast area is set, until the all clear is given by the shotfirer.

Method


If a situation arises where the method described or risks not accounted for in this procedure are in place, then a risk assessment or JSA of the situation will be carried out before commencing the task.

6.1 Preparation for Blasting

1. The shotfirer shall remove and place in a safe and secure position any explosives left over from the shot apart from that required to fire the blast.
2. The shotfirer shall advise the customer delegate when they shall be ready to blast.
3. The shotfirer shall advise (if necessary) statutory authorities, airports, neighbours etc, the exact time of blasting if customer's delegate has not done so. This notification should, if possible, be organised by the customer's delegate prior to commencement of loading.
4. The shotfirer shall select a safe place from where to initiate the blast. It is preferred that a blast shelter be used by the shotfirer. This can be any substantially constructed object such as a loader bucket or dump truck located at a safe distance behind or to the side of the blast.
5. A meeting of the shotfirer, blast controller and any guards/sentries shall take place prior to firing the shot. It is preferable if this meeting takes place before tying up of the blast however, access to all relevant personnel may preclude this. At this meeting the shotfirer shall advise the shot controller to clear all equipment and personnel to safe, predetermined locations for blasting as well outline clearly what steps are required to fire the shot safely. All sentries/guards shall repeat their instructions back to the shotfirer to ensure they have understood their roles and responsibilities. The radio channel to be used during the blast should be made clear to all stakeholders. The sequence of firing shall also be discussed at this meeting to ensure all stakeholders are familiar with the procedure.

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6. The shotfirer or blast controller shall then place all blast guards to block off access to the blast area and to block off any public roads where necessary; guards/sentries shall be used when it is not practical to physically restrict access within the blast demarcation zone.
7. The blast controller shall then check the shot area and ensure that all personnel and equipment has been moved to predetermined locations. He/she shall ensure that blast guards are in correct positions.
8. The blast controller should take up a position that enables him/her safe, clear vision of the shot area or other predetermined area if vision of shot area is obscured, i.e. access road etc.
9. The blast controller shall then contact each of the blast guards and ensure that they are in position and have cleared their designated areas.
10. If at any stage the blast controller can not positively communicate with the blast guards, then the blast shot shall be halted until such time communications are re-established and the blast guard has given his/her all clear signal.
11. When the blast controller has established that the blast guards are in place and the blast area is secure, then the shot control responsibility is handed to the shotfirer.
12. If at any stage anyone enters the blast area, then the guard (or whoever notices the intrusion) shall immediately contact the shotfirer who shall abort the blast and make safe any preparation for firing that may have taken place (unhooking of initiating detonator).
13. The shotfirer should, if possible, locate the initiating detonator away from the blast pattern by use of either a long lead (or multiple short lead) TECNEL® TLD's or by use of "extended Nonel tube". This extended tube can be either a TECNEL® LIL that has had the detonator removed and connected to a TECNEL® TLD at the initiation point by use of an approved connection device.
14. Ensure that all detonators to be used in the blast area are either covered with fine material or are encompassed by an approved plastic clip that is shrapnel resistant. Particular note should be taken of initiating and or detonators used in down hole applications that may be used on the surface.
15. Suitable weights shall be placed on the TECNEL® LIL as required to prevent the "whipping" of the Nonel. This will stop the possible "spraying" of shrapnel and or dislocation of surface connections.

6.2 Firing Electrically

1. The shotfirer shall return to the blasting position and check by radio that all blast guards have been secured and are safe for blasting.
2. Once the signal to proceed has been given to the shotfirer by the blast guards, the shotfirer shall:
3. Run out the firing lines (twin twist), shunt the one end (twist together) and check for electrical continuity.

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4. Check the electric detonator by placing the actual electric detonator in a rill of dirt and then testing the detonator for electrical continuity. This should be carried out at a safe distance from the blast.
5. **CHECKING OF THE ELECTRIC DETONATOR SHALL NOT BE DONE ON THE BLAST.**
6. The checking of continuity shall only be done using an approved electric blasting circuit tester. Both the firing line and electric detonator must be reshunted after testing.
7. The shotfirer shall then ensure that the key to the exploder is on his/her person.
8. The shotfirer shall then re-check that the firing cable is shunted and then tie in the electric detonator to the firing cable. These connections must be done using SCOTCHLOK connectors to prevent earth leakage or otherwise by twisting the bared wires together for at least 25 mm, looping the joined wires back and double twisting. All bare wires shall be insulated with electrical tape after connection has been made.
9. The shotfirer shall then tape the electric detonator to the initiation point of the blast, with the detonator facing towards the pattern. The electric detonator should then be covered by fine material to prevent shrapnel damage to TECNEL® TLD and MS or LP units.
10. The shotfirer shall then return to the firing position, recheck with the blast guards that all remains clear, attach the firing cable to the shot exploder and start the pre-shot count down.

6.3 Firing Non-electrically (Shock tube Starter Line)

1. The shotfirer shall cover the initiating detonator with sufficient fine material to ensure that shrapnel will not disrupt any adjacent signal tubes.
2. The shotfirer shall check by radio that all blast guards have secured their area and it is safe to blast.
3. The shotfirer shall keep the shock tube starter gun or portion of this on his/her person to prevent accidental firing of the shot or starter line.
4. Once the signal to proceed has been given to the shotfirer by the blast guards, the shotfirer shall connect the TECNEL® Lead-in-Line to the initiation point.
5. The shotfirer shall then return to the firing position and commence the pre-shot count down.

6.4 Pre-shot Countdown and Sirens

1. The following sequence of pre-blast warnings shall be given. The only exception to this shall be when a site specific sequence is in place due to site specific safety concerns. If this alternate sequence is used, then it SHALL BE discussed by all stakeholders at the pre shot meeting to ensure all personnel know the required sequence and recorded on the blast risk assessment # 4-1-05.1.

(1) not applicable where no "Free Faces" are available for profiling

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DRILL AND BLAST PROCEDURE					

2. One minute before firing, three short blasts (of no greater than 2 seconds duration shall be given).
3. ON cessation of the third short blast the siren shall sound continuously, the shot should be fired at least 15 seconds after the start of the continuous siren and until the shotfirer requests the siren to stop. If this is before the shot all clear is given, then the shotfirer shall communicate over the radio that "the shot has been fired can the siren be turned off but blast guards remain in place until the all clear is given".

The alternative Warning of Blasting Operations audible system that shall be used in Victoria is as follows:

- A series of 3 short audible signals must be sounded.
- There is a pause of not less than 3 minutes, during which time the blasting area must be checked to ensure everyone is in positions of safety, and
- Two short audible signals are sounded.
- After a one minute pause, a continuous audible signal is sounded.
- The blast is fired as soon as possible after the continuous signal has sounded for fifteen seconds.
- The area is checked and, if all dust and toxic gasses have dispersed and in all other respects the area is safe for return, a long audible signal is sounded.

6.5 Post Shot

1. If fired Electrically the shotfirer shall then remove the firing cable from the exploder and "shunt" the circuit. The shotfirer shall remove the key from shot exploder and place it on his/her person.
2. If firing using shock tube the shotfirer shall either remove the shock tube gun or portion of the shock tube gun and place it on his or her person.
3. The shot firer shall wait at least 5 minutes minimum or until dust and fumes have sufficiently cleared after the shot has been fired before approaching the blast.
4. The shotfirer shall then examine the blast, checking for any tell tale signs indicating a "cut-off" or misfire. The shotfirer should not walk over the broken shot.
5. The all clear signal should then be given "the blast is clear, can the all clear sirens be sounded and guards may stand down from their positions".
6. Three short blasts of at least 1 second duration by the siren shall then be sounded to signal all clear, or alternate siren sequence as determined by site-specific practice.

(1) not applicable where no "Free Faces" are available for profiling

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APPENDIX 5 - Holcim Blast Controller & Shotfirer Duties Checklist/Procedure

Blast Controller and Shot-Firer Duties Checklist/Procedure

SCOPE

The purpose of this procedure is to document the safe method of performing the duties of the Blast Controller & Shot-Firer at Nickol Bay Quarry. It identifies possible hazards, controls to be used and recommended procedure to be followed. The procedure shall be reviewed annually or at anytime conditions change on site. The procedure is to be used in conjunction with the Blasting Contractor's procedure (MAXAM U-Safe Element 3-01-0). All personnel involved in performing this task shall have read this procedure and shall sign the acknowledgement sheet.

1. POTENTIAL HAZARDS

- Explosives
- Weather (fog, rain, high winds)
- Unauthorised access
- Non-essential personnel in area
- Flyrock
- Heat

2. COMPETENCIES

- Nil for Blast Controller
- Shot-firers certificate

3. PERMITS REQUIRED

- N/A

4. PERSONAL PROTECTIVE EQUIPMENT (PPE) (additional to Holcim's Standard Requirements)

- Wide brim for hard hat if leaving cab in hot weather.

5. JOB PREPARATION

Day of blast:

- The date and time of the blast is marked on the blast sign at the entrance to site, and the following are informed:
 - Karratha Airport Manager - (08) 91 868 563. Mob: 0417 904 053
 - Hanson Concrete - (08) 91851599
 - Karratha Shooting Club – Phil Nix: 0429 791 267
 - All personnel at the North West Area office
- The weighbridge operator is to inform all truck drivers of the blast from this point on, until the time of the blast. This is done verbally and by posting a notice on the entrance door to the weighbridge.
- The wind direction is to be considered, and the blast may be postponed if dust generated by the blast is likely to present a hazard to traffic on the Dampier Road.

Blast Control Procedure - Checklist

- 1) The Blast Controller and shot-firer are to ensure that the designated firing times are posted on the board at the entry to the quarry on the morning of the blast and that suitable notification is given to all personnel working in and about the quarry who may be affected by the blasting operations.
- 2) The Blast Controller will designate sufficient Blast Guard positions to protect all access points to the blast area (minimum 500metres) and suitably mark the location.
- 3) All radios intended to be used for the blast to be checked by the Blast Controller and set on UHF channel 16.
- 4) Blast Controller and Shot-firer to adjust watches to mine time.
- 5) Blast Controller checks blast exclusion zone and clearance of designated work groups with the quarry supervisors.

About 10 minutes prior to the designated blast time:

- 6) The Blast Controller calls on UHF channel 16
“BLAST GUARDS MOVE INTO POSITION AND SECURE ACCESS”
- 7) The Blast Controller checks each Blast Guard is in the correct position with access secured by asking:
“BLAST GUARD (#) ARE YOU IN POSITION AND ACCESS SECURED”
- 8) Each Blast Guard will respond with:
“BLAST GUARD (#) IN POSITION AND ACCESS IS SECURED”
- 9) When all Blast Guards have confirmed that all access points are secured, the Blast Controller will call on the radio:
“ATTENTION ALL PERSONNEL, ATTENTION ALL PERSONNEL”
“BLASTING OPERATIONS ARE COMMENCING IN THE NICKOL BAY QUARRY”
“ALL PERSONNEL NOT DIRECTLY INVOLVED WITH BLASTING OPERATIONS ARE INSTRUCTED TO MAINTAIN COMPLETE RADIO SILENCE UNTIL THE ALL CLEAR HAS BEEN GIVEN”
- 10) The Blast Controller will then advise the Shot-firer:
“ALL BLAST GUARDS ARE IN POSITION AND ALL ACCESS IS SECURED”

“I WILL NOW COMMENCE THE SIREN RUN”

- 11) The Blast Controller activates the vehicle siren and performs clearance of the blast exclusion zone. When the clearance run is completed the Blast Controller will notify the Shot-firer by stating the following:

“CLEARANCE RUN COMPLETED”

- 12) The Blast Controller checks that each Blast Guard is still in position by asking:

“BLAST GUARD (#) ARE YOU IN POSITION AND ACCESS SECURED”

(repeats for each blast guard)

- 13) Each Blast Guard will respond with:

“BLAST GUARD (#) IN POSITION AND ACCESS IS SECURED”

- 14) Blast Controller will then ask the Shot-firer:

“ATTENTION SHOT-FIRER – BLAST GUARDS ARE IN POSITION AND ALL ACCESS POINTS ARE SECURED – ARE YOU IN THE DESIGNATED SAFE FIRING POSITION?”

- 15) The shot-firer responds with:

“SHOT-FIRER IS IN POSITION”

- 16) The Blast Controller authorises shot-firer to proceed by responding with:

“SHOT-FIRER – YOU NOW HAVE PERMISSION TO FIRE THE SHOT”

- 17) The Shot-firer commences countdown in increments, calling the following:

“FIRING IN 60 SECONDS,...FIRING IN 30 SECONDS,...FIRING IN 10 SECONDS”

“FIRING NOW”

- 18) Immediately after firing, the Shot-firer announces on radio:

“SHOT FIRED – BLAST GUARDS HOLD YOUR POSITIONS”

- 19) The Shot-firer will approach the blast after firing and when a sufficient cooling period has elapsed to inspect the blast for any visible sign of misfires. If a misfire is evident, the Shot-firer will instruct all Blast Guards to hold position and commences a re-fire of the shot. Shot-firer re-commences procedure from step 17. Once the shot has been successfully cleared of all misfires, the Shot-firer will call the Blast Controller with:

“THE SHOT IS ALL CLEAR OF ANY VISIBLE MISFIRES”

- 20) The Blast Controller will then announce:

“ATTENTION ALL PERSONNEL, ATTENTION ALL PERSONNEL, THE BLAST IS ALL CLEAR- BLAST GUARDS OPEN YOUR POSITIONS AND ACKNOWLEDGE”

- 21) Each Blast Guard will respond with:

“BLAST GUARD (#) POSITION OPEN”

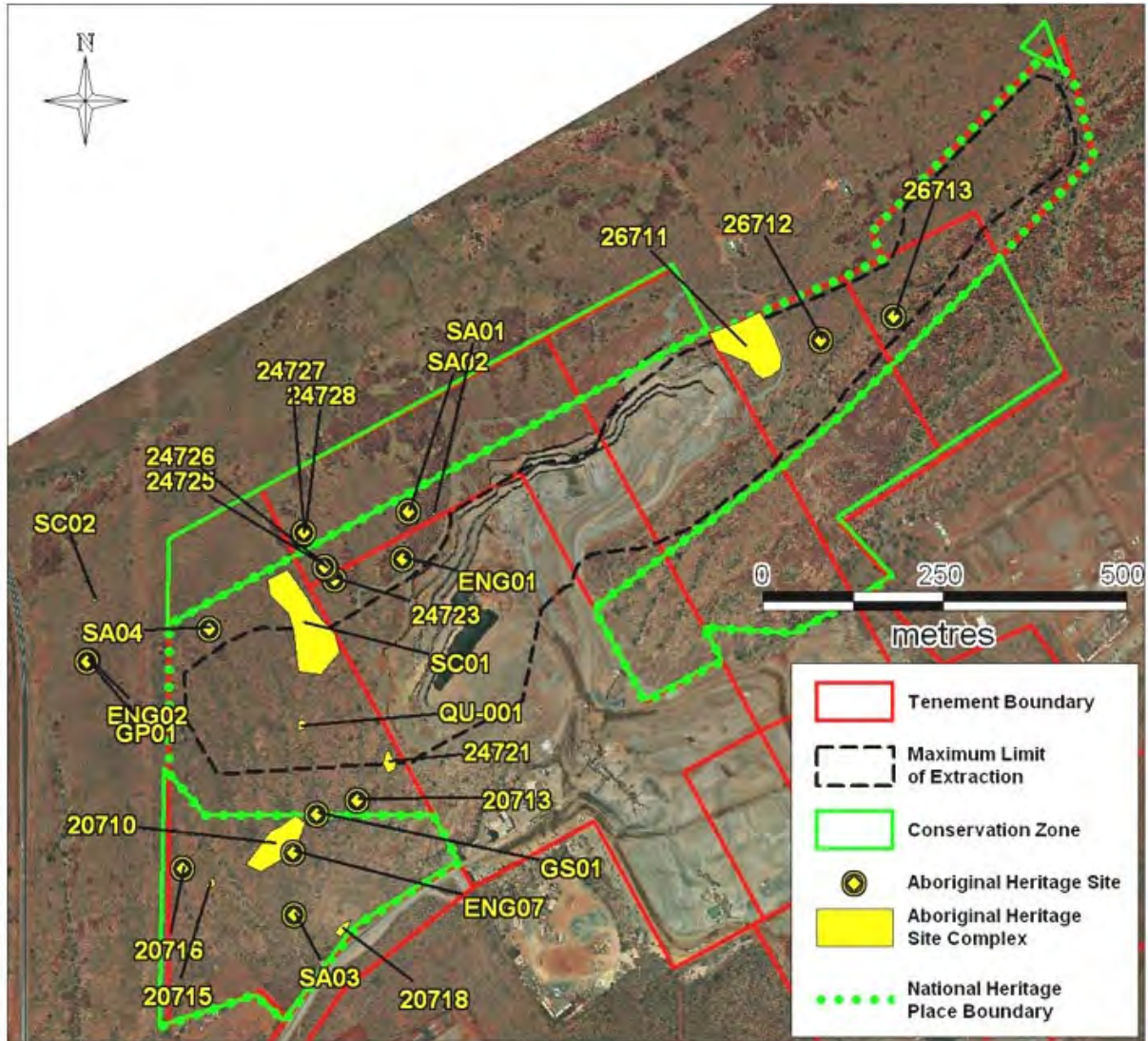
- 22) The Blast Controller will then meet with the Shot-firer for a de-brief and ensure all blast notices are removed.

6. POST BLAST

- The site is inspected for fly rock and damage. Any damage is to be reported on the STARs INCIDENT/ACCIDENT form.

APPENDIX 6 - Aboriginal Heritage Sites at Holcim Nickol Bay Quarry (at 18/07/09)

SITE ID	NAME	SITE TYPE
Eastern Extension		
26711	Cemex Quarry Complex	Engraving, Quarry, Artefacts/Scatter
26712	Cemex Engraving (CESLE001)	Engraving
26713	Cemex Pit (CESLP001)	Man-made structure, Artefacts/Scatter
Current Pit		
SA01	CEM-09-SA-01	Stone arrangement, Engraving
SA02	CEM-09-SA-02	Artefact/Scatter, Engraving, Grinding Platform
Western Extension		
20710	Nickol Bay Quarry (W1)	Man-made structure, Artefacts/Scatter, Quarry
20713	Nickol Bay Engravings (W5)	Engraving
20715	Nickol Bay Engravings (W7)	Engraving, Artefacts/Scatter, Midden/Scatter
20716	Nickol Bay Structure (W8)	Man-made Structure
20718	Nickol Bay Midden (W10)	Artefacts/Scatter, Midden/Scatter
24721	Readymix ECE001	Artefacts/Scatter
24723	Readymix ECE002	Engraving
24725	Readymix ECE003	Engraving
24726	Readymix ECE004	Engraving
24727	Readymix ECE005	Engraving
24728	Readymix ECE006	Engraving
ENG-01	CEM-09-ENG-01	Engravings
ENG-02	CEM-09-ENG-02	Engravings
ENG07	CEM-09-ENG-07	Engravings
GP01	CEM-09-GP-01	Not Available
GS01	CEM-09-GS-01	Not Available
SA03	CEM-09-SA-03	Not Available
SA04	CEM-09-SA-04	Pit
SC01	CEM-09-SC-01	Large-scale Site Complex
SC02	CEM-09-SC-02	Site Complex
QU-001	CEM-09-QU-001	Quarry, Artefact Scatter





HOLCIM NICKOL BAY QUARRY
BLAST MANAGEMENT PLAN

JAN 10 (Amended)
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APPENDIX 7 - Maxam Load Log - Holcim Nickol Bay Quarry

Load Log

Bench 1 South Face
20775 t
6729 kg
6137 kg
160 kg

Rock on Ground
Designed Explosives
Delivered Explosives
MIC

MAXAM
HOLCIM NICKOL BAY
20090527
0
1
8/12/2009

Location / Site
Job Number
Cartnote Number
Version of Plan
Date of Plan

Load Log Explosives 6729 kg

Hole No	BOTTOM EXPLOSIVE						INERT DECK			TOP EXPLOSIVE		TOTAL DESIGN EXPLOSIVE		TOTAL DELIVERED EXPLOSIVE		Comments		
	Depth	Stern	No of Buckets	Hole Size	m	Kg	actual	from m	Length	to m	total	m	Kg	actual	Total Kg		Total Kg	
1	11.5	4.0	3.0	102	0.0	0		11.5	0.00	11.5	0.0	7.5	77	80	77	80		
2	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	77	75	77	75		
3	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	77	74	77	74		
4	11.8	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	77	77	77	77		
5	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	77	78	77	78		
6	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	77	70	77	70		
7	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	78	75	78	75		
8	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	78	72	78	72		
9	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	78	68	78	68		
10	11.6	4.0	3.0	102	0.0	0		11.6	0.00	11.6	0.0	7.6	78	68	78	68		
11	11.6	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	78	72	78	72		
12	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	78	74	78	74		
13	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	78	74	78	74		
14	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	78	74	78	74		
15	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	78	72	78	72		
16	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	78	74	78	74		
17	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	79	75	79	75		
18	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	79	72	79	72		
19	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	79	75	79	75		
20	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	79	75	79	75		
21	11.7	4.0	3.0	102	0.0	0		11.7	0.00	11.7	0.0	7.7	79	70	79	70		
22	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	79	72	79	72		
23	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	79	75	79	75		
24	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	79	74	79	74		
25	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	79	85	79	85		
26	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	79	80	79	80		
27	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	80	80	80	80		
28	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	80	85	80	85		
29	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	80	80	80	80		
30	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	80	85	80	85		
31	11.8	4.0	3.0	102	0.0	0		11.8	0.00	11.8	0.0	7.8	80	80	80	80		
																	Total Kilos	2432