# METROMIX PTY LIMITED

# Blast Management Plan

**(Incorporating a Blast Monitoring Program)**

October 2016

**Initially Approved by**

the Secretary's nominee, Howard Reed,

on 10 October 2013

## Document Control

| | | | | |
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| | | | | |
| **Next Review Due** | Within 3 months of the submission of an:<br>(a) annual review under Schedule 5 Condition 4;<br>(b) incident report under Schedule 5 Condition 7;<br>(c) audit report under Schedule 5 Condition 9:and<br>(d) any modifications to the Project Approval,<br>Note: Metromix will review, and if necessary, also revise the strategies, plans, and programs prepared in accordance with the Project Approval that are referred to in this Strategy. | | | |

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**APPENDICES**



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**TABLES**

# COMMONLY USED ACRONYMS

| | |
|---|---|
| AHD | Australian Height Datum |
| AS | Australian Standard |
| BS | British Standard |
| CCC | Community Consultation Committee |
| DP&E | Department of Planning and Environment |
| ENCM | Environmental Noise Control Manual |
| EP&A Act | Environmental Planning and Assessment Act 2017 |
| EPA | Environment Protection Authority |
| EPL | Environment Protection Licence |
| PA | Project Approval |
| DRE | Division of Resources and Energy |

# 1 INTRODUCTION

This Blast Management Plan (the Plan) has been prepared by Metromix Pty Ltd (Metromix) for the Teralba Quarry (the Quarry). The Quarry is located west of the suburb of Teralba, beyond the western shores of Lake Macquarie (Figure 1.1). The Plan has been prepared in satisfaction of Condition 16 of Schedule 3 of Project Approval (PA) 10_0183 MOD 1 (approved on 16 April 2018). A modification to PA 10_0183 was approved on 16 April 2018.

***Condition 3(16): Blast Management Plan***

*"The Proponent must prepare and implement a Blast Management Plant for the project to the satisfaction of the Secretary. This plan must:*

*(a) be submitted to the Secretary for approval within 4 months from the date of project approval;*

*(b) be prepared in consultation with the Council and interested members of the local community potentially affected by blasting operations;*

*(c) describe the measures that would be implemented to ensure:*

- *best management practice is being employed; and*
- *compliance with the relevant conditions of this approval;*

*(d) include a road closure management plant for blasting within 500 metres of a public road, that has been prepared in consultation with Council;*

*(e) include a specific blast fume management protocol to demonstrate how emissions will be minimised including risk management strategies if blast fumes are generated; and*

*(f) include a monitoring program for evaluating the performance of the project including;*

- *compliance with the applicable criteria; and*
- *minimising fume emissions from the site."*

*The Proponent must implement the plan as approved by the Secretary.*

The plan addresses the following elements.

- The activities approved under PA 10_0183 *MOD 1*.
- The consultation undertaken during preparation of this Plan.
- The legal and other requirements associated with management of blast emissions from the Quarry.


REFERENCE
Property Boundary
Quarry Site Boundary

SCALE 1:60 000 (A4)

1 0 1 2 3km

Base Map Source: Newcastle (1983) & Lake Macquarie (1977) 1:100 000 Topographic Maps

Figure 1.1
LOCALITY PLAN

- The objectives and key performance outcomes for this Plan and the Quarry.
- Roles and responsibilities in implementing this Plan.
- Competence training and awareness for Metromix's personnel and contractors.
- The proximity of surrounding residences.
- A description of the potential blast-related impacts.
- Blast management measures that will be implemented during the ongoing operation of the Quarry.
- Blast-related monitoring that will be undertaken.
- Evaluation of compliance with blast criteria.
- Corrective and preventative actions that will be implemented should exceedance(s) of the relevant criteria be identified.
- Complaints handling and response procedures that will be implemented.
- Incident reporting procedures.
- Publication of monitoring information.
- Plan review.

The above elements reflect each of the relevant specific issues outlined in *Condition 5(3)* of PA 10_0183 MOD 1, where relevant.

Blasting has been undertaken at Teralba Quarry for in excess of 40 years, 27 years of which has been undertaken by Metromix. Hence, this Plan reflects the considerable experience gained and documentation retained over those years.

## 2 APPROVED ACTIVITIES

The approved activities within the Teralba Quarry comprise the full range of activities undertaken prior to 22 February 2013 and the extension of extraction operations to the north and south of the previously approved extraction areas. The approved activities on site comprise the following, the locations of which are displayed on **Figure 2.1**.

- Conglomerate extraction (blasting and excavation).
  - Southern Extraction Area.
  - Mid Pit Extraction Area.
  - Southern Extension.
  - Northern Extension.
- Processing Operations (size reduction, screening and blending).
  - Existing processing plant and pug mill.

Y:\Jobs 531 to 1000\559\Post April 2004\Reports\55954_Annual Review 2017\CAD\559BaseMGA56.dwg_1.2 Approved Quarry Layout-19.07.2018-10:15 AM

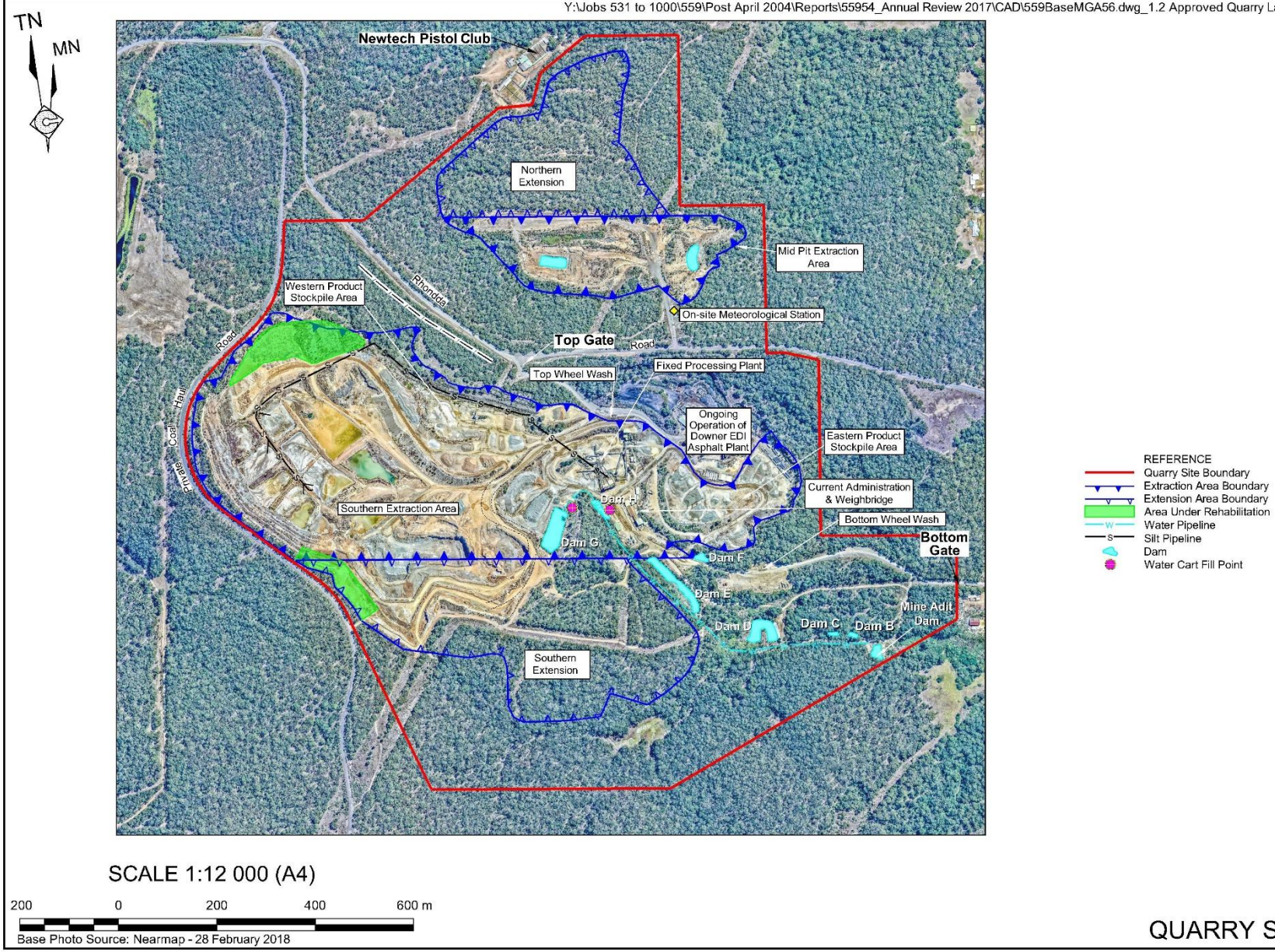



Figure 2.1
QUARRY SITE LAYOUT

- On-site Load and Haul Operations.
  - Off-road trucks on the on-site road network.
  - Proposed conveying primary-crushed rock from the Southern and Northern Extensions to processing plant (including conveyor beneath Rhondda Road).
- Off-site Transportation of Products.
- Vehicle/equipment maintenance and ancillary activities and stores.
- Administration and product despatch.
- Progressive rehabilitation and maintenance.

The sequence of extraction throughout the life of the Quarry will be consistent with the staging of vegetation clearing and therefore retirement of biodiversity credits specified in Conditions 3(54) to 3(56) of PA 10_0183 MOD 1. It is estimated that extraction activities over approximately the next 15 years, will only take place in the Southern Extension. Subject to sales, extraction activities will be progressively transferred beyond this period to the extraction areas north of Rhondda Road.

The relevant limitations upon the approved activities nominated in Conditions within Project Approval 10_0183_MOD 1 are as follows.

- "The Proponent shall not carry out quarrying operations below 20 AHD in the Southern Extension and 24m AHD in the Mid Pit Extraction Area and Northern Extension" (*Condition 2(6)* of PA 10_0183 MOD 1).
- "The Proponent shall not extract more than 1.2 million tonnes of extractive materials from the site in any calendar year" (*Condition 2(7)* of PA 10_0183 MOD 1).

"The Proponent shall not:

a) transport more than 1 million tonnes of quarry products from the site in any calendar year; or

b) despatch more than 326 laden trucks from the site on any day; or

c) despatch more than 241 laden trucks per day or 20 per hour westwards along Rhondda Road;

d) despatch more than 85 laden trucks per day or 8 per hour eastwards through Teralba;

e) despatch laden trucks for travel through Teralba between 6:00pm and 6:00am; or

f) receive unladen trucks via the Railway St entrance between 6:00pm and 7:00am"

(*Condition (2(8)* of PA 10_0183 MOD 1).

The approved quarry life is until 31 December 2038 (*Condition 2(5)* of PA 10_0183 MOD 1) and the approved hours of operation are set out in **Table 2.1** in accordance with *Condition 3(6)* of PA 10_0183 MOD 1.

**Table 2-1: Approved Hours of Operation**

| Day | Receipt of Concrete or VENM | Loading and Despatch of Quarry Trucks | Extraction and Processing Operations |
|---|---|---|---|
| Monday to Friday | 7:00am to 5:00pm | 4:00am Monday to midnight Friday | 7:00am to 7:00pm |
| Saturdays | 7:00am to 2:00pm | midnight Friday to 6:00pm Saturday | 7:00am to 2:00pm |
| Sundays and Public Holidays | None | None | None |

Note: Maintenance activities may occur at any time provided they are inaudible at privately owned residences.

The approved hours of operations of blasting are between 10:00am and 4:00pm Monday to Friday, in accordance with *Condition 3(10)* of PA 10_0183 MOD 1.

# 3 CONSULTATION

## 3.1 GOVERNMENT AGENCY CONSULTATION

A version of this plan prepared and approved in June 2013 was prepared in consultation with Council's Senior Sustainability Officer. The final document reflected the comments provided by Council.

An updated draft of this plan prepared following approval of a modification to PA 10_0183 was provided to Council in October 2018. Comments provided by Council are included as Appendix XX.

## 3.2 COMMUNITY CONSULTATION

*Condition 3(16)* of PA 10_0183 MOD 1 requires this Plan to be prepared in consultation with "interested members of the local community potentially affected by blasting operations". The proposed blasting for both the Southern and Northern Extensions will occur at distances greater than 500m from any residences, i.e. the distance considered to be a threshold below which residents will not be potentially affected by blasting at the Teralba Quarry. This position is supported by the absence of substantiated blast-related complaints over many years of blasting. Notwithstanding this position, Metromix undertook a letterbox drop to all residences fronting the following streets in Teralba or as otherwise listed.

- Rhondda Road
- Watkins Lane
- Rodgers Street
- Railway Street (105 to 157)
- Pitt Street
- Myrtle Street
- James Street

The letter invited any resident to review or discuss the Blast Management Plan or practices. Metromix consults with the Community Consultative Committee twice per year and no issues relating to air quality or noise has been raised by the committee.

# 4 LEGAL AND OTHER REQUIREMENTS

## 4.1 PROJECT APPROVAL PA10_0183 *MOD 1*

Metromix was granted *Project Approval (PA) 10_0183 MOD 1* on 22 February 2013 pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The approval includes a comprehensive set of conditional requires that Metromix must comply with during the life of the Quarry and sets out the core requirements of this Plan in *Condition 5(3)* of PA 10_0183 MOD 1. Blast-related conditions relevant to operations within the Quarry within this approval are reproduced in **Table 4.1**.

**Table 4-1: Blast-related Project Approval Conditions – Operations**

Page 1 of 2

<table>
<tr><th>Condition</th><th>Requirement</th></tr>
<tr><td>3(9)</td><td>
Blasting Criteria<br>
The Proponent shall ensure that the blasting on the site does not cause exceedances of the criteria in Table 4.<br>
Table 4: Blasting Criteria
<table>
<tr><th>Location</th><th>Airblast overpressure (dB(Lin Peak))</th><th>Ground vibration (mm/s)</th><th>Allowable exceedance</th></tr>
<tr><td rowspan="2">Any residence on privately owned land, or any public infrastructure</td><td>120</td><td>10</td><td>0%</td></tr>
<tr><td>115</td><td>5</td><td>5% of the total number of blasts over a period of 12 months</td></tr>
</table>
However, these criteria do not apply if the Proponent has a written agreement with the relevant owner or infrastructure provider/owner, and the Proponent has advised the Department in writing of the terms of this agreement.
</td></tr>
<tr><td>3(10)</td><td>
Blasting Hours<br>
The Proponent shall only carry out blasting onsite between 10:00am and 4:00pm Monday to Friday inclusive. No blasting is allowed on weekends or public holidays, or at any time without the written approval of the Secretary.
</td></tr>
<tr><td>3(11)</td><td>
Blasting Frequency<br>
The Proponent shall not carry out more than one blast a day on site, unless an additional blast is required following a misfire.
</td></tr>
<tr><td>3(12)</td><td>
Property Inspections<br>
If the Proponent receives a written request from the owner of any privately-owned land within 500 meters of proposed blasting for a property inspection to establish the baseline condition of any buildings and/or structures on his/her land, or to have a previous property inspection report updated, then within 2 months of receiving this request the Proponent shall:<br>
a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:<br>
- establish the baseline condition of any buildings and/or structures on the land, or update the previous property inspection report; and<br>
- identify any measures that should be implemented to minimise the potential blasting impacts of the project on these buildings and/or structures; and<br>
b) give the landowner a copy of the new or updated property inspection report.
</td></tr>
</table>

**Table 4.1: Blast-related Project Approval Conditions – Operations (Cont'd)**



| Condition | Requirement |
|---|---|
| 3(13) | **Property Investigations**<br>If the owner of any privately-owned land claims that the buildings and/or structures on his/her land have been damaged as a result of blasting on site, then within 2 months of receiving this claim in writing from the landowner the Proponent shall:<br>a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties, to investigate the claim; and<br>b) give the landowner a copy of the property investigation report.<br>If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damages to the satisfaction of the *Secretary*.<br>If the proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the *Secretary* for resolution. |
| 3(14) | **Operating Conditions**<br>During blasting operations, the Proponent shall:<br>a) implement best management practice to:<br>- protect the safety of people and livestock in the surrounding area;<br>- protect public or private infrastructure/property in the surrounding area from any damage; and<br>- minimise the dust and fume emissions of any blasting:; and<br>b) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site,<br>to the satisfaction of *Secretary*. |
| 3(15) | The Proponent shall not undertake blasting within 500 metres of:<br>a) any public road without the approval of Council; or<br>b) any land outside the site not owned by the Proponent, unless:<br>- the Proponent has an agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Proponent has advised the Department in writing of the terms of this agreement, or<br>- the Proponent has:<br>▪ demonstrated to the satisfaction of the *Secretary* that the blasting can be carried out closer to the land without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and<br>▪ updated the Blast Management Plan to include the specific measures that will be implemented while blasting is being carried out within 500 meters of the land. |

## 4.2 STATEMENT OF COMMITMENTS

**Table 4.2** presents the blast-related commitments relevant to operations within the Quarry from the Statement of Commitments incorporated as Appendix 3 in the Project Approval and where each is addressed in this Plan.

**Table 4-2: Blast-related Commitments – Operations**

| Commitment | Requirement |
|---|---|
| 10.9 | Review blast designs and modify, if required. |
| 11.8 | Schedule blasts so that they do not occur during high wind situations. |

## 4.3 ENVIRONMENT PROTECTION LICENCE

**Table 4.3** presents the relevant blast-related requirements from Section L5 within Environment Protection Licence (EPL) 536.

**Table 4-3: Blast-related Environment Protection Licence 536 Conditions**

| Condition | Requirement | Addressed in Section |
|---|---|---|
| **BLASTING** | | |
| **Environment Protection Licence** | | |
| L6.1 | Blasting in or on the premises must only be carried out between 1000 hours and 1600 hours Monday to Friday. Blasting in or on the premises must not take place on weekends or Public Holidays. | 8.2 |
| L6.2 | The licensee is only permitted to carry out one (1) blast per day at the premises, unless an additional blast is required flowing a blast misfire. | 8.2 |
| L6.3 | The airblast overpressure level from blasting operations at the premises must not exceed:<br>a) 115dB (Lin Peak) at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period.<br>b) 120dB (Lin Peak) at any noise sensitive locations.<br>At any sensitive noise location. Error margins associated with any monitoring equipment used to measure this are not be taken into account in determining whether or not the limit has been exceeded. | Section 8 and Section 9 |
| L6.4 | Ground vibration peak particle velocity from the blasting operations at the premises must not exceed:<br>a) 5mm/sec at any time at any noise sensitive location for more than five per cent of the total number of blasts over each reporting period.<br>b) 10mm/sec at any time at any noise sensitive location.<br>Error margins associated with any monitoring equipment used to measure this are not be to be taken into account in determining whether or not the limit has been exceeded. | Section 8 and Section 9 |
| L6.5 | Blasting limits apply at any residence, or noise sensitive location that is not owned by the licensee or subject of a private agreement between the owner of the residence or noise sensitive location and the licensee as to an alternative ground vibration or overpressure level. | Figure 7.1 |

### 4.4 STATUTORY REQUIREMENTS

Blasting at the Teralba Quarry is conducted in accordance with the following statutes:

- Work Health and Safety (Mines and Petroleum) Act 2013.
- Work Health and Safety (Mines and Petroleum Sites) Regulation 2014.
- Work Health and Safety Act 2011.
- Work Health and Safety Regulation 2017.
- Explosives Act 2003.
- Explosives Regulation 2013.

## 5 OBJECTIVES AND OUTCOMES

**Table 5.1** presents the objectives and key performance outcomes relating to blasting at Teralba Quarry.

**Table 5-1: Objectives and Key Performance Outcomes**

| Objectives | Key Performance Outcomes |
|---|---|
| **Blast** | |
| (a) To ensure compliance with all relevant Project Approval and Environment Protection Licence conditions, commitments and reasonable community expectations. | (i) Compliance is achieved with all relevant criteria nominated in **Tables 4.1, 4.2** and **4.3** and community complaints are minimised. |
| (b) To implement appropriate blast management and mitigation measures throughout the life of the Quarry. | (ii) All identified blast management and mitigation measures are implemented to the extent required. |
| (c) To implement an appropriate monitoring program to establish compliance or otherwise with relevant criteria throughout the life of the Quarry. | (iii) All nominated monitoring is undertaken in accordance with the relevant procedures for all blasts. |
| (d) To implement an appropriate complaints handling and response protocol | (iv) Complaints (if any) are handled and responded to in an appropriate and timely manner. |
| (e) To implement continual improvement for investigating, implementing and reporting on reasonable and feasible measures to reduce blasting impacts. | (v) An appropriate continual improvement program will be implemented throughout the life of the Quarry. |
| (f) To implement an appropriate incident reporting program, if required. | (vi) Incidents (if any) are reported in an appropriate and timely manner. |

## 6 PERSONNEL MANAGEMENT

### 6.1 ROLES AND RESPONSIBILITY

**Table 6.1** presents the roles and responsibilities for the implementation of this Plan.

**Table 6-1: Roles and Responsibilities for Blast Management**



| Role | Responsibility |
|---|---|
| Quarry Manager | Oversee the implementation of the Blast Management Plan.<br>• Coordinate blast monitoring in accordance with this Plan.<br>• Notify regulatory authorities and affected landholders of any blasting related exceedance and undertake associated reporting.<br>• Coordinate periodic reviews of this Plan.<br>• Assist the Blasting contractor with investigations of blasting exceedances, incidents or complaints.<br>• Coordinate the implementation of the Metromix blast monitoring program in accordance with this Plan.<br>• Coordinate the management of records and reporting of blast monitoring results.<br>• Manage blasting related complaints in accordance with the complaints management procedure.<br>• Maintain records for blasts initiated |
| Quarry Supervisor | • Ensure the drill pattern is drilled in accordance with the blast design; and<br>• Ensure that the blast is loaded with the correct quantity and quality of explosive and stemmed in accordance with the blast design.<br>• Ensure all Metromix requirements are complied with during blasting operations<br>• Notify the Blasting Contractor of any factors that may lead to non-compliance with this Plan.<br>• Ensure the pre-blast checklist is strictly complied with.<br>• Load and fire blasts in accordance with the design supplied by the Blasting Contractor.<br>• Record drill status, including hole depths, pattern and relevant information, including any environmental issues and electronically stored on a database. |
| All personnel and blast contractors | • Comply with all relevant Air Quality and Control Measures |

The Quarry Manager will also be responsible for ensuring the appropriate blast management training is included in the induction for the relevant personnel.

## 6.2 COMPETENCE TRAINING AND AWARENESS

Metromix personnel are currently responsible for positioning and drilling all blast holes and a contractor delivers, loads and initiates all explosives. The contractor also monitors each blast.

All Metromix personnel involved in drilling and blasting operations and contractors and their employees are required to undergo training. The following areas are covered in the training.

- Blast management awareness.
- Communication procedures.
- Sentry Responsibilities.
- Lower Level Management Plan

In addition to the general training above, the driller, their supervisor and the personnel handling, transporting, loading and initiating the shot receive specialised explosive training and licencing.

# 7 SURROUNDING RESIDENCES AND POTENTIAL BLAST-RELATED IMPACTS

## 7.1 SURROUNDING RESIDENCES

**Figure 7.1** displays the locations of residences surrounding the Quarry Site. No residences are located within 500m of any proposed blasting nor have a direct line of sight to the planned blasting areas within approved extraction areas principally due to the design of the extraction areas whereby topography within extraction areas will shield the effects of blasting.

## 7.2 POTENTIAL BLAST-RELATED IMPACTS

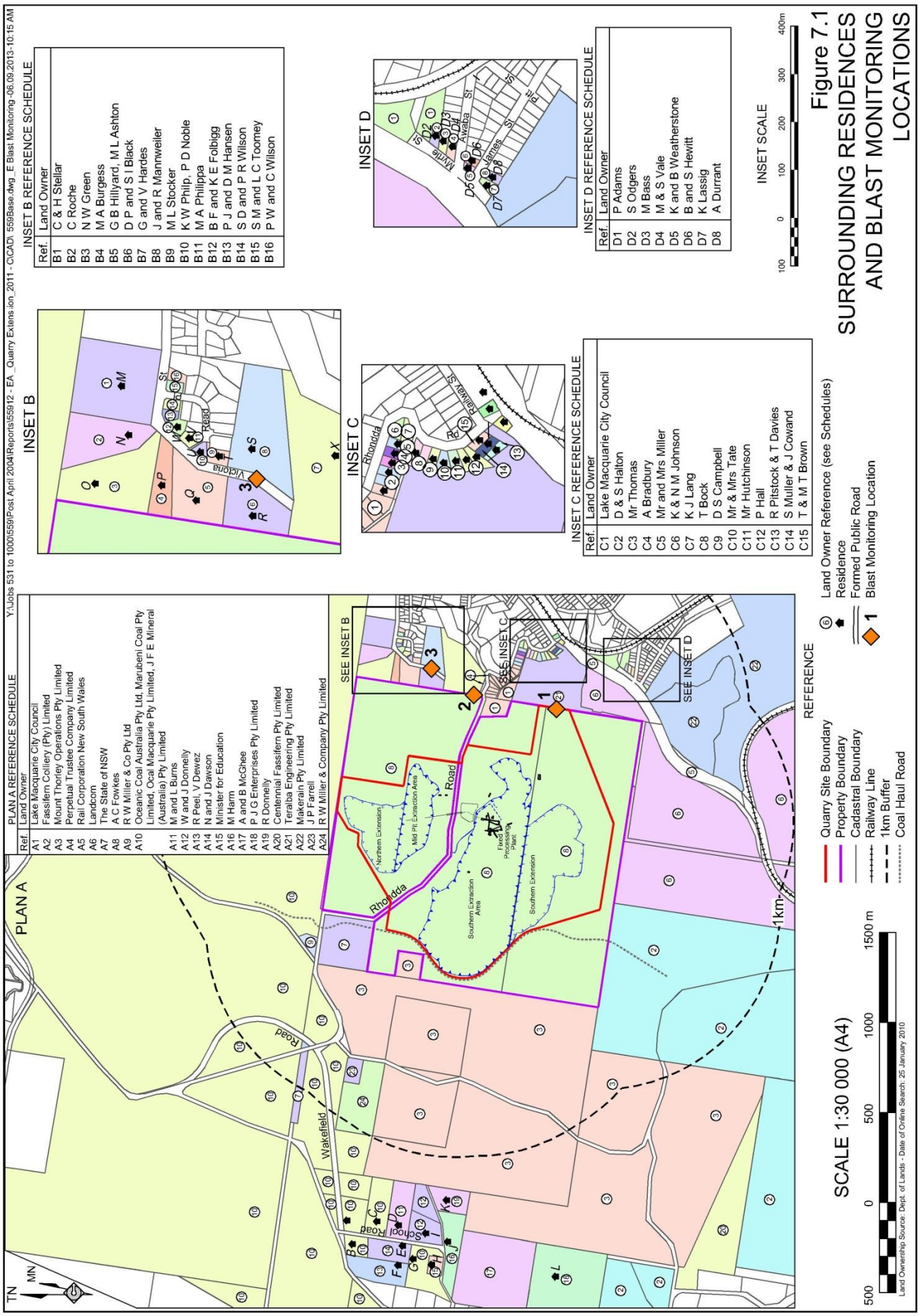
### 7.2.1 Introduction

Blasting at Teralba Quarry is required to fragment the conglomerate which is loosely cemented. The type of blasts initiated are not conventional face blasts but rather blasts to disaggregate the conglomerate in situ which does not involve substantial movement of the conglomerate. Each blast at Teralba Quarry typically yields between approximately 10 000 tonnes and 50 000 tonnes and will typically occur up to twice per week.

This section describes the potential airblast overpressure and ground vibration structural impacts of blasting and the blast emission levels that were predicted during the environmental assessment of the proposed activities. This information was used in the design of mitigation measures and monitoring procedures described in Sections 10 and 11 to ensure best practices are adopted for blast management for the Quarry. In addition, this information will be used to ensure practices are developed for the continual improvement of blast management as described in Section 13.

The following sub-sections are provided as background information for members of the public and others who may be unfamiliar with blasting operations and describes the various blasting-related criteria and impacts on built structures associated with blasting operations.

Air blast overpressure is a pressure wave that travels through the air following a blast, while ground vibration is caused by energy from the blast travelling through the intervening rock strata surrounding the blast location.


PLAN A
PLAN A REFERENCE SCHEDULE
Ref. Land Owner
A1 Lake Macquarie City Council
A2 Fassifern Colliery (Pty) Limited
A3 Mount Thorley Operations Pty Limited
A4 Perpetual Trustee Company Limited
A5 Rail Corporation New South Wales
A6 Landcom
A7 The State of NSW
A8 A C Fowkes
A9 R W Miller & Co Pty Ltd
A10 Oceanic Coal Australia Pty Ltd, Marubeni Coal Pty Limited, Ocal Macquarie Pty Limited, J F E Mineral (Australia) Pty Limited
A11 M and L Burns
A12 W and J Donnelly
A13 R Peel, V Dewez
A14 N and J Dawson
A15 Minister for Education
A16 M Harm
A17 A and B McGhee
A18 P J G Enterprises Pty Limited
A19 R Donnelly
A20 Centennial Fassifern Pty Limited
A21 Teralba Engineering Pty Limited
A22 Makerain Pty Limited
A23 J P Farrell
A24 R W Miller & Company Pty Limited
INSET B
INSET B REFERENCE SCHEDULE
Ref. Land Owner
B1 C & H Stellar
B2 C Roche
B3 N W Green
B4 M A Burgess
B5 G B Hillyard, M L Ashton
B6 D P and S I Black
B7 G and V Hardes
B8 J and R Mannweiler
B9 M L Stocker
B10 K W Philp, P D Noble
B11 M A Philippa
B12 B F and K E Folbigg
B13 P J and D M Hansen
B14 S D and P R Wilson
B15 S M and L C Toomey
B16 P W and C Wilson
INSET C
INSET C REFERENCE SCHEDULE
Ref. Land Owner
C1 Lake Macquarie City Council
C2 D & S Halton
C3 Mr Thomas
C4 A Bradbury
C5 Mr and Mrs Miller
C6 K & N M Johnson
C7 K J Lang
C8 T Bock
C9 D S Campbell
C10 Mr & Mrs Tate
C11 Mr Hutchinson
C12 P Hall
C13 R Pitstock & T Davies
C14 S Muller & J Cowand
C15 T & M T Brown
INSET D
INSET D REFERENCE SCHEDULE
Ref. Land Owner
D1 P Adams
D2 S Odgers
D3 M Bass
D4 M & S Vale
D5 K and B Weatherstone
D6 B and S Hewitt
D7 K Lassig
D8 A Durrant
INSET SCALE
100 0 100 200 300 400m
Figure 7.1
SURROUNDING RESIDENCES AND BLAST MONITORING LOCATIONS
REFERENCE
Land Owner Reference (see Schedules)
Residence
Formed Public Road
Blast Monitoring Location
Quarry Site Boundary
Property Boundary
Cadastral Boundary
Railway Line
1km Buffer
Coal Haul Road
SCALE 1:30 000 (A4)
500 0 500 1000 1500 m
Land Ownership Source: Dept. of Lands - Date of Online Search: 25 January 2010
SEE INSET B
SEE INSET C
SEE INSET D
Rhondda
Wakefield
Road
School Road
Railway St
Victoria
Read
Mayne
Awaba
James
Northern Extension
Mid Pit Extraction Area
Southern Extraction Area
Fixed Processing Plant
Southern Extension
1km

### 7.2.1 Airblast Overpressure Structural Impacts

Plaster that has cracked within residences is the type of damage that is monitored in most airblast overpressure complaints. However, it is window panes that fail before any other structural damage. The probability of damage to window panes exposed to a single airblast overpressure event is listed in **Table 7.1**.

**Table 7-1: Airblast Overpressure Structural Impacts**

| Airblast Overpressure dB Linear | Level kPa | Probability of Damage | Effects on Window Panes |
|---|---|---|---|
| 140 | 0.2 | 0.01% | No damage – windows rattle |
| 150 | 0.6 | 0.5% | Very occasional failure |
| 160 | 2.0 | 20% | Substantial failure |
| 180 | 20 | 95% | Almost all fail |

It should be noted that Metromix operates with an airblast overpressue limit of 115dB for the majority of blasts (a exceedance to a limit of 120dB is permitted is permitted for 5% of blasts).

### 7.2.2 Ground Vibration Structural Impacts

Guide values presented in the British Standard BS 7385 that have been assessed to determine the level of ground vibration that minimises risks for cosmetic damage to residential and industrial buildings are listed in **Table 7.2.**

**Table 7-2: Ground Vibration Structural Impacts**

| Line | Type of Building | Peak Component Particle Velocity in Frequency Range of Predominant Pulse | |
|---|---|---|---|
| | | 4Hz to 15Hz | 15Hz and above |
| 1 | Reinforced or framed structures. Industrial or commercial buildings. | 50mm/s above 4Hz | 50mm/s |
| 2 | Unreinforced or light frame structures. Residential or light commercial buildings | 15mm/s to 4Hz increasing to 20mm/s to 15Hz | 20mm/s to 15Hz increasing to 50mm/s to 40Hz |
| Source: BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration | | | |

### 7.2.3 Flyrock Impacts

Blasting effectively fragments rock to allow it to be excavated and processed to yield the products required by customers. The energy released during a blast not only fragments the rock to the required size but can propel the fragmented rock a distance from the blast site. Every blast is designed with a blast envelope in which the fragmented rock is designed to remain within. For blasts at Teralba Quarry, the blast envelope is typically <50m from the blast site. Periodically, irregular discontinuities in the conglomerate or other localised features cause the fragmented rock to be propelled beyond the blast envelope. This rock is referred to as “flyrock”.

Potential flyrock impacts relate to both property damage or injury to persons within the area where flyrock lands. For Teralba Quarry, the potential flyrock impacts should not affect the closest residences to an approved extraction area within Teralba Quarry as all blasts will be initiated at distances greater than 500m. This distance is well in excess of the 50m blasting envelope and the predicted 200m "safety zone" nominated by Orica Explosives (see **Appendix 1**).

The potential for persons or domestic/farm animals to be present within the "safety zone" during a blast is highly unlikely as it is Metromix's practice to have two sentries on the coal haul road in conjunction with sentries on our internal road network.

It is estimated that during the next 15 years blasting will be confined to the Southern Extension which is between 1450m and 2300m from the closest residence to the west and between 790m and 1630m from the closest residence to the east. Rhondda Road is approximately 400m north of the closest blasting location within the Southern Extension. Given these distances and the flyrock assessment by Orica (**Appendix 1**), there will be no need to notify any residents or close Rhondda Road for short periods during a blast. It is noteworthy that Metromix has been blasting in the Southern Extraction Area at distances of 200m to 450m from Rhondda Road over the past 20 years without incident.

### 7.2.4 Fumes

Blasts have the potential to generate fugitive gases or fumes comprising mainly nitric oxide (NO) and nitrogen dioxide ($NO_2$). The concentration of $NO_2$ presents the greatest concern with respect to health impacts. The presence of the oxides of nitrogen is invariably observed as visible clouds with a light brown (low concentrations) to dark orange (high concentrations) colour. The generation of oxides of nitrogen is attributable to many causes although ingress/presence of moisture is a common cause.

## 7.3 PREDICTED LEVELS OF BLAST EMISSIONS

During the environmental assessment of the Teralba Quarry extensions, the predicted levels of airblast overpressure and ground vibration were assessed by Spectrum Acoustics (2011) for a range of distances and maximum instantaneous charges with the results presented in **Table 7.3**.

Given the many hundreds of blasts initiated at the quarry in the past Metromix has considerable experience in adjusting the maximum instantaneous charge and other blast design parameters to ensure the blasting criteria are satisfied. Further information on the design of the blasts and control measures is provided in Section 8.2.

In order to ensure that blast emissions remain within the specified EPL criteria, the site blast emission site law will continue to be regularly reviewed.

**Table 7-3 Theoretical Overpressure and Ground Vibration Values**

| Distance | Airblast Overpressure (dB) | Ground Vibration (PVS) |
|---|---|---|
| **12kg MIC** | | |
| 450m | 114.3 | 0.64 |
| 600m | 112.6 | 0.45 |
| 700m | 111.7 | 0.37 |
| 800m | 110.9 | 0.32 |
| 1000m | 109.6 | 0.24 |
| **20kg MIC** | | |
| 450m | 115.3 | 0.88 |
| 600m | 113.6 | 0.62 |
| 700m | 112.7 | 0.51 |
| 800m | 111.9 | 0.44 |
| 1000m | 110.7 | 0.33 |
| **40kg MIC** | | |
| 450m | 116.4 | 1.34 |
| 600m | 114.7 | 0.94 |
| 700m | 113.8 | 0.78 |
| 800m | 113.0 | 0.66 |
| 1000m | 111.7 | 0.50 |
| **60kg MIC** | | |
| 450m | 117.0 | 1.71 |
| 600m | 115.3 | 1.20 |
| 700m | 114.4 | 1.00 |
| 800m | 113.6 | 0.85 |
| 1000m | 112.3 | 0.65 |

## 7.4 MONITORED BLAST IMPACTS

Metromix provides a summary of all blast monitoring in the Annual Review for each year. **Table 7.4** provides a summary of results over the period from 2013 to 2017. The results demonstrate the negligible blast impacts experienced over this time and reinforce the assertion that Metromix has comprehensive experience planning blast events at the Quarry.

**Table 7-4 Blast Monitoring Results 2013 – 2017**

| Year | Number of Blasts | Blast Monitor Not Triggered | Percentage Not Triggered | Highest Airblast Over pressure (dB(L)) | Highest Ground Vibration (mm/s) |
|---|---|---|---|---|---|
| 2013 | 32 | 26 | 81.3% | 109.5 | 0.81 |
| 2014 | 41 | 37 | 90.2% | 119.0 | 0.75 |
| 2015 | 31 | 30 | 96.8% | 109.9 | 0.22 |
| 2016 | 39 | 39 | 100% | - | - |
| 2017 | 36 | 8 | 22.2% | 112.8 | 0.84 |
| Criteria | | | | 115/120 | 5.0/10.0 |

# 8 CONTROL MEASURES

## 8.1 INTRODUCTION

*Condition 3(16)(c)* of PA 10_0183 MOD 1 requires this Plan to describe the measures that will be implemented to ensure:

- best management practice is being employed; and
- compliance with the relevant conditions of *Project Approval 10_0183 MOD 1* (**Table 4.1**).

## 8.2 OPERATING HOURS AND FREQUENCY OF BLASTING.

Metromix will ensure that the approved operating hours for blasting (10:00am to 4:00pm Monday to Friday only )and conditions identified in (**Table 4.1)** are strictly complied with.

The Quarry Manager will be responsible for ensuring the operating hours are included in Metromix's and the contractor's Safe Work Method Statements and that no breaches of this condition will be tolerated.

Blasting will occur no more than once per day except in the event of a misfire. Historically blasting has been required no more than twice per week.

## 8.3 OPERATING CONDITIONS

### 8.3.1 Blasting Operations

*A*ll blasting will be undertaken in accordance with *AS 2187.2 Explosive Storage, Transport and Use (2006).* The following lists the key control measures that will be implemented to satisfy these requirements.

- Blast design including limiting Maximum Instantaneous Charge (MIC).
- Drilling and loading techniques.
- Blasting techniques including types of explosives and detonators being used.
- Timing of blast (initiation sequence, timing and direction).

### 8.3.2 Flyrock, Dust and Fume Management Measures

All blasting will continue to be undertaken with the adoption of the following well-proven control measures at Teralba Quarry to minimise flyrock and dust emissions from each blast.

- Control of burdens.
- Minimum of 1.8m of 10mm or 14mm stemming material.

Metromix has worked closely with its explosive supplier to implement management measures that avoid/minimise the generation of oxides of nitrogen and hence any visible blast fumes. The key management measures adopted are as follows.

- Control of explosive type and optimum/correct fuel content for damp and wet holes, i.e. use of a heavy ANFO-based explosive.
- Ensuring weathered, soft conglomerate is removed by bulldozer or excavator and not blasted.
- Utilising free face blasts whenever possible.
- Reduce the number of fully confined blasts.
- Maintain relatively small blasts, i.e. <10t explosive.

### 8.3.3 Management of Airblast Overpressure

As per AS2187.2 (2006) control measures that may be effective in reducing the impact of airblast may include one or more of the following.

- Delay intervals.
- Burden and spacing.
- Stemming – amount and type.
- Direction of initiation.
- Charge depth.
- Charge confinement.
- Blasthole deviation.
- Geological conditions.
- Wind and weather conditions.

### 8.3.4 Safety Measures

The Quarry Manager will be responsible to ensure that the relevant safety measures have been implemented prior to blasting within the Quarry.

## 8.4 PROPERTY INSPECTIONS

Given all surrounding residences are greater than 500m from the approved extraction area where blasts will be initiated, no property inspections will be required.

## 8.5 PROPERTY INVESTIGATIONS

The Quarry Manager will be responsible to ensure any claims of damage due to blasting are managed according to the requirements of *Condition 3(13)* of Project Approval 10_0183 *MOD 1*.

# 9 MONITORING

## 9.1 INTRODUCTION

*Condition3(14)(a)(b)* of PA 10_0183 MOD 1 requires that this Plan include a protocol for evaluating blasting impacts and demonstrating compliance with the blasting criteria at all privately-owned residences and structures. This sub-section has been prepared in satisfaction of that requirement.

All blast monitoring will be undertaken in accordance with the following.

## 9.2 BLAST MONITORING LOCATIONS

**Figure 7.1** shows the locations of three blast monitoring sites used to monitor airblast and ground vibration from blasts undertaken at Teralba Quarry. The locations and coordinates of each monitoring site are as set out in **Table 9.1**.

**Table 9-1 Blasting Monitoring Locations**

| Site | Easting | Northing |
|---|---|---|
| 1 | 368912 | 5351945 |
| 2 | 369065 | 6352305 |
| 3 | 369139 | 6352621 |

## 9.3 FUME MONITORING

Fume monitoring will be undertaken utilising the following procedure.

- Video recording and analysis of each blast to determine visible fume generation and the resulting video being stored for a minimum of one year;
- Video footage for each blasting event will be taken for a minimum of at least 1 minute duration and follow the blast until the visible fume (if present) has dissipated or leaves the view of the camera;
- Evaluate any visible fume event in accordance with colour chart analysis (refer to AEISG, 2011 Appendices 2 and 3 for details) and records for fume assessment must be kept for a minimum of 2 years; and
- Record the meteorological conditions during the period any visible fume occurs.

## 9.4 BLAST MONITORING PROTOCOL

Each blast will be monitored for airblast overpressure and ground vibration at the locations identified in **Table 9.1.** Blast monitoring is undertaken at two locations during each blast. Blasts initiated south

of Rhondda Road are monitored at Sites 1 and 2 whilst blasts north of Rhondda Road are monitored at Sites 2 and 3.

All blast monitoring instrumentation will be installed, calibrated and maintained in accordance with both AS2187.2 - 2006 and the manufacturer's specifications.

The Blasting Contractor will be responsible for blast monitoring and Metromix's Quarry Supervisor is responsible for over-seeing the monitoring and reviewing the video of each blast.

## 10 EVALUATION OF COMPLIANCE

The monitoring results will be reviewed by the Quarry Manager and a record of the time of blast and ground vibration and overpressure included within the results table for *Annual Review*. A copy of the results sheet will be updated on Metromix's website on a monthly basis.

## 11 CORRECTIVE AND PREVENTATIVE ACTIONS

In the event that blast monitoring identifies an exceedance of the blast criteria identified in *Conditions 3(8)* and *3(9)* of PA 10_0183 MOD 1, the exceedance will be investigated to determine the likely cause. All corrective and preventative actions are entered into the Rapid Online Reporting Database. An investigation will then follow to determine:

- what immediate action(s) shall be taken to fix the problem in the short term, if applicable;
- the root causes of the problem (i.e. management system, human factors/behaviour, work environment, training);
- corrective actions required to eliminate the root cause(s);
- action(s) taken to verify effectiveness of corrective action(s) (i.e. what measures and checks are taken to ensure the corrective actions that are in place are effective to prevent any further exceedance).

On completion of the investigation, an electronic copy will be forwarded to Metromix's Risk Manager for review/approval of corrective and preventative actions.

In accordance with Metromix's SHE procedures, if an event or activity occurs within the Quarry Site that has caused, is causing, or is likely to cause harm to the environment, whether the harm occurs on or off the premises, Metromix will report the event to the EPA after it becomes known to any employee or contractor. The reporting will be undertaken in accordance with the Company's Pollution Incident Response Management Plan, i.e. DP&E and EPA will be notified by Metromix as soon as practicable after the incident and a report will be prepared and submitted to the DP&E and EPA within 7 days of the exceedance in accordance with *Condition 5(7*) of PA 10_0183 MOD 1.

Corrective and/or preventative actions will be assigned to relevant Metromix personnel. Actions will be communicated internally through planning meetings and toolbox talks and outstanding actions will be monitored for their effectiveness upon completion.

## 12 COMPLAINTS HANDLING AND RESPONSE

Metromix will advertise the community inquires/complaints line 02 4950 6640 as a minimum in the local phone directory and may also consider advertising the number through local media or on newsletters.

Metromix will respond to any registered community inquiries or complaints received by this number as described in the Rapid Online Reporting System.

The following flowchart shows the process that Metromix will follow in the event a noise complaint is received.

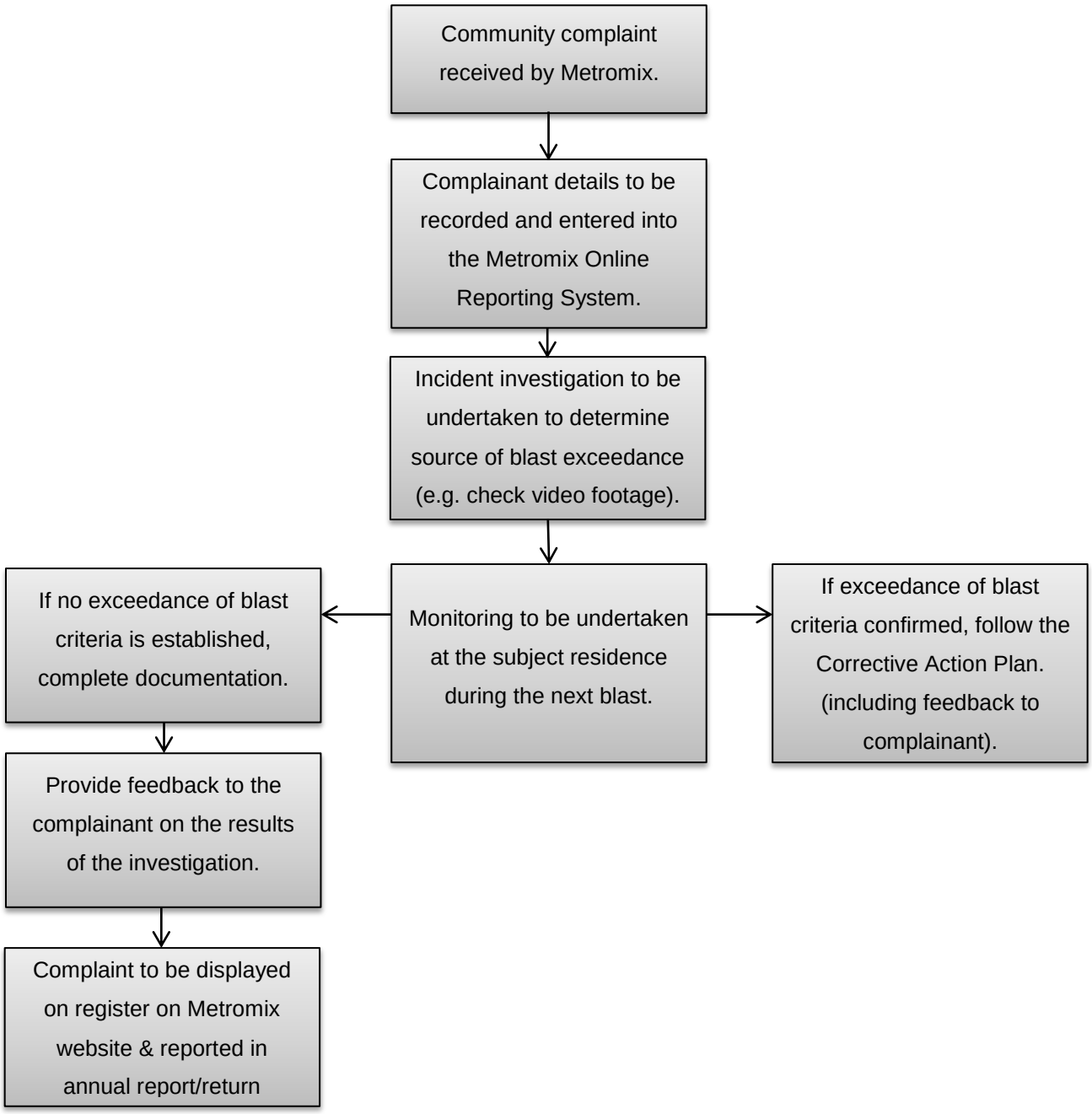
All complaints will be recorded using a proforma complaints record sheet and the nature and outcome of the complaint and subsequent investigation provided in summary form to the Community Consultative Committee and in the Annual Review.

## 13 INCIDENT REPORTING

Metromix will report on the performance of the Blast Monitoring Program in each Annual Review and provide regular updates to members of the Community Consultative Committee (CCC). Each Annual Review will include:

- Blast monitoring results and comparison to performance criteria;
- Any blast-related complaints and management/mitigation measures undertaken;
- Management/mitigation measures undertaken in the event of any confirmed exceedance of performance criteria; and
- Review of the performance of management/mitigation measures and the monitoring program.

All Annual Reviews will be provided to the CCC and published regularly on the Metromix website.




## 14 PUBLICATION OF MONITORING INFORMATION

The following information relating to each blast initiated at the Quarry will be included in the each Annual Review and included in the Metromix website:

a) the date and time of the blast;

b) the location and approximate elevation of the blast on the premises;

c) the blast monitoring results at each blast monitoring station; and

d) an explanation for any missing blast monitoring results, if relevant.

Blast monitoring results will also be presented at CCC meetings and will also be made available to the public via the Metromix Website. These results are to be updated on a monthly basis.

## 15 PLAN REVIEW

In accordance with *Condition 5(3)(h)* of PA 10_0183 MOD 1*,* this *Blast Management Plan* will be reviewed and, if required, revised within 3 months of an:

a) annual review;

b) incident report;

c) independent audit report; or

d) any modification Project Approval 10_0183 *MOD 1*.

The Quarry Manager will be responsible for the review of this Plan.

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# Appendix 1

## Orica – Flyrock Assessment

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12th November 2012

<u>Defining calculations from flyrock spreadsheet:</u> Maximum Flyrock Range from Cratering

The calculations used in the spreadsheet for flyrock trajectory are from the ISEE Handbook (International Society of Explosives Engineers).

Catering projection Range = $30 \times d^{0.667}$ d = charge diameter

The maximum projection range for cratering was formulated during field studies by Swedish workers (Lundborg 1975). The equation was developed from measurements made during crater blasting in which explosives charges were inserted into shallow blastholes producing a maximum flyrock range of 260m for a 25mm hole charge, approximately 650m for a 100mm hole charge and approximately 1400m for a 311mm diameter charge.
These should be considered to be near maximum likely range of projection of flyrock but NOT typical distances from normal bench blasting operations. The authors noted that normal bench blasting with a greater degree of burial of charge, produced maximum projection distances generally around one sixth (⅙) of those produced in crater blasting.

The calculations for cratering may be used by Orica at very sensitive sites where there is no relief (no free face) for example hard rock construction sites where only very small charges are used.

Orica does not use the cratering projection calculations for normal bench blasting.

If you have any questions or queries regarding this definition, please let me know.

Kind regards,

Richard Leghissa
Technical Services Engineer
Quarry & Construction
Orica Mining Services

ORICA
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# Definitions & Recommendations using spreadsheet for clearance zones:

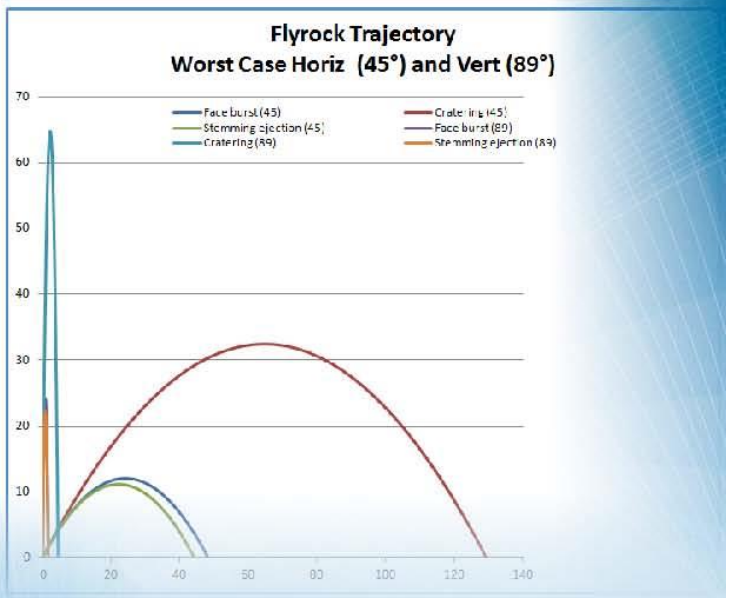
For clearance zones use the face burst distances. Cratering is rare in quarries because a free face is used providing relief and our quarry benches are prepared to contain the energy from blasting ie appropriate stemming, competent ground. Recommend using the Factor of Safety 4 (Human) for clearance zones.

Cratering is used at sites where there is no relief for example hard rock construction sites, only very small charges are used.

Max flyrock projection (Cratering) range is an independent calculation from the ISEE Blasters Handbook and uses Hole Diameter as the main factor, the formula is based off field crater experiments. Not recommended for quarry use.

| Flyrock Assumptions | | |
|---|---|---|
| Rock density | g/cc | 2.7 |
| Hole diameter | mm | 102 |
| Stemming length | m | 2.6 |
| Charge length | m | 10.3 |
| Burden | m | 3.8 |
| Explosive density | g/cc | 1.2 |
| Flyrock constant | | 28 |
| Factor of safety | FoS | 1 |
| Trajectory angle (Stemming ejection) | deg | 10 |
| Charge mass/m | kg/m | 9.0 |
| Gravity | m/s/s | 9.81 |
| **Scaled Depth of Burial** | | |
| Contributing charge length factor | | 10 |
| Scaled depth of burial | m/kg^1/3 | 1.44 |
| **Maximum Flyrock Projection Range** | | |
| Distance | m | 655 |
| **Clearance Distance and Projectile Size** | | |
| Projectile size | mm | 27 |
| Projectile weight | kg | 0.02 |
| Clearance Distance | m | 108 |
| **Maximum Horizontal Distance** | | |
| Face burst | m | 48 |
| Cratering | m | 130 |
| Stemming ejection | m | 44 |
| **Maximum Vertical Distance** | | |
| Launch velocity (FB) | m/s | 22 |
| Launch velocity (C) | m/s | 36 |
| Launch velocity (SE) | m/s | 21 |
| Face burst | m | 24 |
| Cratering | m | 65 |
| Stemming ejection | m | 22 |

| | Maximum Horizontal Distance | | | Maximum Vertical Distance | | |
|---|---|---|---|---|---|---|
| Factor of Safety | 1 | 2 (Equip) | 4 (Human) | 1 | 2 (Equip) | 4 (Human) |
| Face burst | 48 | 97 | 193 | 24 | 48 | 97 |
| Cratering | 130 | 259 | 518 | 65 | 130 | 259 |
| Stemming Ejection | 44 | 88 | 177 | 22 | 44 | 88 |

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