

Strength. Performance. Passion.

Lynwood Quarry Blast Management Plan

Holcim Australia February 2020

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1. Introduction

1.1 Background

Holcim (Australia) Pty Lid (Holcim) was granted development consent in December 2005 (DA 128-5-2005)(Development Consent) by the then NSW Minister for Planning for the construction and operation of a hard rock quarry known as Lynwood Quarry west of Marulan in the Southern Tablelands region of NSW (refer to **Figure 1**). There have been 5 modifications approved to the Development Consent since 2005.

1.2 Project Description

The location of Lynwood Quarry and extent of the approved 30 year quarry pit is shown in **Figure 1**. The quarry has existing Development Consent approval to produce up to five million tonnes per annum (Mtpa) of saleable quarry product until 2038. The target resource has an expected life in excess of 90 years. Some of the material extracted as part of the quarrying process is not suitable for processing and sale, consequently emplacement areas are required.

1.3 Purpose and Scope

This Blast Management Plan is to ensure compliance with statutory requirements at Lynwood Quarry. The management plan addresses the requirements contained in the Development Consent (DA 128-5-2005) and the Environment Protection Licence (EPL 12939).

1.4 Objectives

The objectives of this Blast Management Plan include:

- Establish a blast monitoring system to assess the impact of blast emissions (noise and vibration) on surrounding sensitive receivers with the management of blasting to consider 'best practice' principles;
- Provide a mechanism to assess monitoring results against relevant Development Consent criteria to evaluate compliance;
- Detail the requirement for reporting blast criteria exceedances to the relevant stakeholders;
- Detail the controls to be implemented to minimise blasting impacts from the site, including potential impacts from blast fume generation;
- Manage blast-related community complaints in a timely and effective manner; and
- Detail the independent review process to be followed if Lynwood Quarry receives a written request by a landowner(s) for an independent review of blast impacts.

2. Stakeholder Consultation

2.1 Pre 2019 Consultation

In accordance with Schedule 3 Condition 11 of the Development Consent, this Blast Management Plan was sent to the DPIE for approval in November 2016.

2.2 2019/2020 Consultation

A copy of the 2019 updated Blast Management Plan was sent to the Department of Planning, Industry and Environment (DPIE) for review and approval. In an email from DPIE on 29 January 2020, they requested '*detailed baseline data in Section 4 or a summary of the data*'. Section 4 has been updated to reflect these changes.

3. Statutory Requirements

3.1 Development Consent Requirements

A summary of the relevant Development Consent requirements are outlined in the table below

Table 1 Summary of Development Consent Requirements

Conditi	ons	Addressed in Section
	le 3 Condition 11	
The App develop the stan	Dicant must prepare a Blast Management Plan for the ment to the satisfaction of the Secretary. In addition to idard requirements for management plans (see condition medule 5) this plan must:	This document
a)	Be submitted to the Secretary for approval by 30 November 2016, unless otherwise agreed by the Secretary	Previously submitted to meet this date
b)	Describe the measures that would be implemented to ensure compliance with the last criteria and operating conditions of this consent;	Section 8
c)	Include a monitoring program for evaluating and reporting on compliance with the blasting criteria in this consent; and	Section 7
d)	Include a protocol for investigating and responding to complaints.	Section 7
Schedu	Ile 5 Condition 2	
required	Management Plan Requirements Applicant must ensure that the Management Plan d under this consent are prepared in accordance with any t guidelines, and include:	
a)	Detailed baseline data;	Section 4
b)	A description of:	Section 3 and 6
	 The relevant statutory requirements (including any relevant approval, licence or lease conditions): Any relevant limits or performance measures/criteria; and The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; 	
c)	A description of the measures that would be implemented to comply with the relevant statutory requirements, limits of performance measures/criteria	Section 7
d)	 A program to monitor and report on the: Impacted and environmental performance of the development; and Effectiveness of any management measures (see (c) above); 	Section 8
e)	A contingency plan to manage any unpredicted impacts and their consequences	Section 9 and 10
f)	A program to investigate and implement ways to improve the environmental performance of the development over time;	Section 10
g)	 A protocol for managing and reporting any: Incidents; Complaints; Non-compliances with statutory requirement: and Exceedance of the impact assessment criteria and/or performance criteria 	Section 9

Conditions	Addressed in Section
3. Prior to approval of management plans required under Schedule 3, all existing management plans, monitoring programs, strategies, programs, protocols, etc. approved as at the date of approval of Modification 4 shall continue to have full force and effect, and may be revised under the requirements of condition 5 below as if subject to the conditions of this consent that applied prior to approval of Modification 4, or otherwise with the approval of the Secretary.	Section 11

3.2 EIS Statement of Commitments

The table below outlined the Statement of Commitment requirements.

Table 2 EIS Statement of Commitment Requirements

Commitment	Addressed in Section	
Blast	Section 7; and Section 8	

4. Baseline Blasting Data

The blast assessment undertaken for the granite and ignimbrite pits within their respective environmental assessments indicate blasting operations will meet compliance requirements at all residences, infrastructure locations and heritage sites.

Monitoring locations are shows in **Figure 1**. Historical blast monitoring is outlined in the Annual Review with there being no exceedance of blast criteria (see **Section 6**) from 2011 to 2019. There have been no exceedances (2019) for blasting at Lynwood. Since March 2018 most blasting has occurred in the granite pit. From March 2018 to December 2019 there has been:

- 108 blasts in the granite pit in 2018 and 79 blasts in the granite pit in 2019;
- All within criteria with the majority of blasts below trigger levels; and
- All blasts have been monitored.

5. Potential Blasting Impacts

Blasting impacts were assessed for the 2005 EIS and subsequent modifications. Providing blasts are designed and implemented correctly by experienced blast professionals then blasting impacts were modelled to be within the Development Consent criteria.



Image Source: Google Earth (2018) Data Source: LPI (2014), Holcim Australia (2015) Updated in December 2019 by SLR Consulting (Location of DD12)

Legend

- ∟ _ Approved Project Area
- Granite Pit Disturbance Footprint
- Meteorological Station
- Depositional Dust Monitoring Location 0 HVAS Location
- •
- Blasting Monitoring Location \bigcirc
- Noise Monitoring Location
- Groundwater Piezometer
- Surface Water Monitoring Location
- Site Water Management Dams
- Granite Pit Surface Water Monitoring Location SW8 to SW11
- 0 Residence Location
- Marulan Public School \circ
- 0 Marulan Childrens Centre

1:45 000

Figure 1 Environmental Monitoring Network

File Name (A4): R01/4541_003.dgn 20190319 14.26

6. Blast Assessment Criteria

Schedule 3, Conditions 7 and 8 of the Development Consent specify the airblast overpressure and ground vibration impact assessment criteria (**Table 3-5**).

Table 3 Airblast Overpressure Impact Assessment Criteria

Airblast Overpressure Level (dB (Lin Peak)	Allowable Exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Table 4Ground Vibration for Residences

Peak Particle Velocity (mm/s)	Allowance Exceedance	
5	5% of the total number of blasts over a period of 12 months	
10	0%	

Table 5 Ground Vibration for Public Infrastructure

Peak Particle Velocity (mm/s)	Infrastructure
25	Main Southern Railway Line Reservoir
100	Gas Pipeline

A summary of the criteria to be used at each monitoring point is included in **Table 6**. The EPL blasting criteria (Condition L4 of the EPL) is the same as the consent requirements.

Table 6 Summary of Blast Emission Criteria

Location	Vibration Criteria (mm/s)	Airblast Criteria (dBL)
Private Residences	5/10	115/120
Main Southern Railway Line	25	n/a
Gas Natural Pipeline	100	n/a
Water Reservoir*	25	n/a

*Note: the water reservoir has not been built by Goulburn Mulwaree Council. As a result, no monitoring is undertaken at this location.

Table 7 shows the days and times blasting is restricted for all blasting at Lynwood Quarry with these outlined in the Statement of Commitments (Appendix 11 of the Development Consent).

Table 7Blasting Day and Time Restrictions

Activity Day		Time
Blasting	Monday – Saturday	9 am to 5 pm
Diasung	Sunday and Public Holidays	None

7. Blast Management

Typical drill and last activities at Lynwood Quarry are for the purpose of blasting overburden, inter-burden and primary raw feed (PRF) from the active pit area to achieve operational requirements.

Blasts typically expected at Lynwood Quarry are detailed in Table 8. Table 8 also outlines operational controls for blasts.

Mitigation ID	Mitigation Measures	Reference Document	When Required	Responsibility
Engineering Des	ign for Different Blasts			
BL1	Production - Blasting on defined bench levels within the pit	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer
BL2	Contour - Blasting on natural topographic surfaces. Variable drill hole depths and material is typically overburden with cap rock.	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer
BL3	Final Wall - Blasting designed to assist in achieving final wall designs (with our without the aid of pre-splits)	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer
BL4	Ramp - Can mean drill and blasting on a haul road map i.e at grade) or drill and blast from flat level to achieve a ramp design (varying drill hole depths sometimes referred to as a drop cut) or for sump development	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer
BL5	Pre – Splits - Specialised blasting technique designed to control final wall design.	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer
BL6	Secondary - Drill and blast activities for oversize, toe within a bench.	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer
BL7	Blast Design - design of each blast to meet the required criteria and considering the particular needs, location, geological conditions of each blast. Appropriate blast initiation sequences will be used to minimise impacts with blast MIC limited as required to meet vibration and overpressure criteria.	Best practice. Previous Blast Management Plan	During blasting design phase	Pit Manager and Shot Firer

Table 8 Blasting Types Typical for Lynwood Quarry

Mitigation ID	Mitigation Measures	Reference Document	When Required	Responsibility
	Detailed design for each blast in order to maximize the blast efficiency, minimize dust, fumes, ground vibration and air blast, the potential for fly rock as well as to ensure compliance with site specific blasting conditions will be completed.			
Operational Cor	ntrols			
BL8	An exclusion zone will be established for each blast to protect the safety of personnel and assets.	Covers Schedule 3 Condition 9 of the Development Consent.	All blasts	Pit Manager and Shot Firer
BL9	Blast monitoring will inform future designs so that they can be optimized based on the increase of detailed site information.	Best practice. Previous Blast Management Plan.	All blasts	Pit Manager and Shot Firer
BL10	All blasts will be video recorded.	Best practice. Previous Blast Management Plan.	All blasts	Pit Manager and Shot Firer
BL11	Pre Blast Weather Review - a pre-blast review of environmental conditions (including weather conditions) to not undertake blasting in conditions which may significantly increase blasting impacts or dust impacts	EIS Statement of Commitments.	All blasts	Pit Manager and Shot Firer
BL12	Blasts are typically undertaken between 10 am and 3 pm noting that blasting is permitted to be undertaken between 9 am and 5 pm Monday to Saturday	EIS Statement of Commitments.	All blasts	Pit Manager and Shot Firer
BL13	A blast monitoring system is in place at Lynwood Quarry with the results of monitoring used to assess compliance and feedback into the site blast model to provide for ongoing refinement of blast design.	EIS Statement of Commitments.	All blasts	Pit Manager and Shot Firer
BL14	A blast notification process in accordance with Condition 10 of Schedule 3 of the Development Consent which requires Holcim to notify residents of upcoming blasts, operate a blasting hotline and keep the community informed about this hotline.	EIS Statement of Commitments.	All blasts	Pit Manager and Shot Firer
BL 15	Blast Fume Protocol as per Section 7.1.	EIS Statement of Commitments.	All blasts	Pit Manager and Shot Firer

7.1 Blast Fume Management Protocol

In accordance with the requirements of Schedule 3 Condition 9(c) of the Development Consent, Holcim are required to implement a blast fume protocol to minimize blast fumes emanating from the Lynwood Quarry operation. The following management controls will be undertaken:

- Use of appropriately qualified personnel. This includes an assessment of whether the contractor is appropriately trained to undertake the drill or blast works;
- Use of appropriate blast design as approved by the Quarry Manager or delegate;
- Prior to blasting, a visual weather assessment of meteorological conditions will be undertaken by the Quarry Manager. If weather conditions require further consideration, the Pit Manager will liaise with the site Environmental representative to confirm that the weather conditions are not conducive to fume migration; and
- All blasts will be video recorded to confirm whether any blast fume has been generated. In the event that blast fume is generated, an investigation into the cause of the blast fume will be undertaken.

8. Blast Monitoring

8.1 Meteorological Monitoring

A meteorological station is installed at Lynwood Quarry as detailed on **Figure 1** in accordance with the requirements of Schedule 3 Condition 15A of the Development Consent. The data will be used to assess weather prior to blasting. No blasting is to occur in undesirable weather conditions.

8.2 Description of Blasting Activities for Site

Monitoring will be undertaken in accordance with the ANZECC Guidelines "Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration": Instrumentation will meet Australian Standards and the specifications in **Table 9**.

Table 9 Blast Monitoring Equipment Specifications

Specification	Seismic	Air Blast
Sample Rate	Minimum 1024 samples per second per channel	
Frequency Response	2 Hz to 250 Hz (3 dB points)	
Resolution	0.016 mm/s	0.1dB
Range	0.1 mm/s to 254 mm/s	88 dB to 148dB
Accuracy	3% at 15 Hz	0.2 dB at 30 Hz
Communications Link	Keyboard a	and Modem
Recording Mode	Full Waveform Recording and Archiving	

8.3 Monitoring Locations

Blast monitoring will be undertaken at the locations shown in **Figure 1**. The points required to be monitored for the ignimbriate and granite pits are summarized in **Table 10**.

Table 10 Blast Monitoring Locations

Blast Location	Required Monitoring Site (refer to Figure 1)	
Ignimbrite Pit	1-3	
Granite Pit	4-6	

As per the EPL, all monitoring records will be:

- In a legible form, or in a form that can readily be reduced to a legible form;
- Kept for a least four years; and
- Produced in a legible form to any authorized officer of EPA who asks to see them.

The following records will also be kept for each blast:

- Date;
- Time;
- Monitoring point/location;
- The name of the person who undertook the monitoring;
- Measured vibration;
- Measured overpressure;
- Maximum instantaneous charge;
- Number of holes and estimated rock tonnage;
- Blast type;
- Meteorological conditions;
- Environmental aspects (dust plume extent and direction); and
- Video recording of each blast.

9. Reporting and Compliance Management

9.1 Evaluation of Blast Results and Reporting

All blast monitoring results will be publicly available on Holcims website.

Holicm will report blasting data annually, including a historical comparison, in the Annual Review to the DPIE. Annual reporting to the EPA will be completed through the EPL Annual Return.

If the monitoring results are found to be outside the sites blast criteria the Quarry Manager will initiate the following protocol:

- As soon as becoming aware of the breach of results the Quarry Manager will notify the Holcim NSW Planning and Environment Manager and enter the incident into INX.
- The Quarry Manager will notify the Secretary of the DPIE of the EPA of the incident as soon practicable.
- A report will be prepared and submitted by the Quarry Manager to the DPIE and EPA within 7 days of becoming aware of the incident, this report will include:
 - Cause of the non-compliance.
 - Environmental Harm caused due to the non-compliance.
 - Actions undertaken to rectify the non-compliance and ensure.

Following the reporting of subsequent review, should it be concluded that the Quarry is the source of elevated blast results, the continuous improvement process outlined in the EMS is to be implemented and corrective actions identified.

9.2 External Reporting

A summary of blast monitoring results will be provided in the Lynwood Quarry Annual Review. The Annual Review will be prepared and submitted to the Secretary, in accordance with Schedule 5 Condition 10 of the Lynwood Quarry Development Consent. The Annual Review will be made available to the public through the CCC and the Lynwood Quarry web site.

In addition, in accordance with Protection of the Environment Legislation Amendment Act 2011 (Amendment Act) and Schedule 5 Condition 13 of the Development Consent, Holcim will also publish blast monitoring results on the Holcim website http://www.holcim.com.au).

Performance monitoring, which includes an assessment of the effectiveness of monitoring and compliance with the relevant Development Consent and EPL conditions, may be discussed at Community Consultative Committee (CCC) meetings.

The effectiveness of the blast management controls utilised at Lynwood Quarry will be reported to DPIE within the Annual Review by the reporting of monitoring data. The Annual Review will also identify whether any additional management controls are required to be implemented at Lynwood Quarry or whether there are any technological advancements in blasting which are suitable for implementation at Lynwood Quarry.

Any investigations related to exceedances will be detailed in the Annual Review.

9.3 Community Complaints and Independent Review

9.3.1 Community complaints

Complaints relating to blasting from Lynwood Quarry are to be managed in accordance with the requirements of the Lynwood Quarry EMS. A summary of complaints will be published on the Lynwood Quarry website and provided in the Annual Review.

Holcim maintains a blast hotline that allows the community to contact Lynwood Quarry with respect. This hotline also allows members of the community within a two kilometer radius to register and be notified of blasting activities.

Table 12 summarises the potential blasting and related issues that may arise and the appropriate corrective action to be taken.

Problem	Corrective Action	
Exceedance of conditions for airblast or ground vibration criteria	Investigation of exceedance, undertake mitigation measures for future blasting where applicable. Report exceedance to DPIE, EPA and Senior management as required.	
Community Complaints	Investigation of complaint, undertake mitigation measures where applicable and provide feedback to complainant. Report complaint to senior management. Provide feedback to quarry planning and production personnel where relevant.	
Private property damage as a result of blasting operations	Investigation of issue and initiation of measures where appropriate. Report issue to senior management. If requested, an independent review of the blast impacts at the property may be undertaken. The independent review will be conducted in accordance with the Development Consent.	

 Table 11
 Blast Complaints and Non Compliance Management

9.3.2 Independent Review

In the event a landowner considers Lynwood Quarry is exceeding blast criteria at his or her property, the landowner may request an independent review of the blast impacts at the property. The independent review will be conducted in accordance with the procedure described in Schedule 4 Condition 2 of the Development Consent.

9.4 Training

All employees and contractors involved with blasting on the site will undergo a site induction and training, which will cover issues relating to blast management, including:

- The existence and requirements of this Plan;
- Blast control measures, including exclusion zones;
- Complaints reporting.

Further details regarding staff induction and training are outlined in the EMS.

10. Adaptive Management

Where a non-compliance relating to blast criteria has occurred, Holcim will to the satisfaction of the secretary of the DPIE:

- Take all reasonable and feasible measures to ensure the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the DPIE describing those options and any preferred remediation measures or other course of action; and
- Implement remediation measures as directed by the Secretary of DPIE.

Incidents will be reported internally through the corrective action program and mitigation measures are to be completed prior to actions being signed off internally.

Section 9.3.1 provides examples of complaints and non – compliance management relating to blasting.

The Continuous improvement process shall strive to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any nonconformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement;
- Make comparisons with objectives and targets; and
- Regular review of data and trends.

11. Review and Improvement

This Blast Management Plan will be reviewed, and revised as necessary, in accordance with the requirements of Schedule 5 Condition 5 of the Development Consent which states: *within 3 months of the submission of an:*

- (a) incident report under condition 8 below;
- (b) Annual Review under condition 10 below;
- (c) audit report under condition 11 below; and
- (d) any modifications to this consent,

The Applicant must review, and if necessary revise, the strategies, plans, and programs required under this consent, to the satisfaction of the Secretary.

In terms of sub clause b), the requirement to review and update management plans will be assessed during the preparation of each Annual Review. The Annual Review will state which management plans require updating and which management plans do not require updating. Details on the requirements to prepare Annual Reviews are outlined in the Environmental Management Strategy.

Update versions of management plans will be put on the website.

https://www.holcim.com.au/about-us/community-link/lynwood/planning-approvals-reporting

12. Roles and Responsibilities

Environmental roles and responsibilities for Lynwood Quarry personnel are outlined below.

Table 12Roles and Responsibilities

Roles	Accountabilities for this document	
Lynwood Quarry Manager	 Approve appropriate resources for the effective implementation of this plan. 	
Lynwood Pit Manager	 Provide sufficient resources for the implementation of this plan; 	
	 Coordinate the implementation of blast management controls and strategies in accordance with this Plan; 	
	 Coordinate the blast monitoring requirements of this Plan, and evaluate and report monitoring results as required; 	
	 Coordinate blast related incident investigations and reporting as required by legislation and internal standards and guidelines; and 	
	 Coordinate the review of this plan in accordance with the requirements of the Development Consent. 	
Lynwood Quarry Support	 Implement and maintain the Management Plan, 	
Services Supervisor	 In consultation with the Quarry Manager, undertake liaison with regulatory authorities and the community in relation to environmental matters. 	
Holcim Planning and Environment Co-ordinator	 Assist in the coordination of noise related incident investigations and reporting as required by legislation and internal standards and guidelines; and 	
	Assist with the review of this Plan.	

13. References

AEISG 2011. Prevention and Management of Blast Generated NOx Gases in Surface Blasting – Code of Practice

Australian and New Zealand Environment Conservation Council (ANZECC) (2011) Technical

Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.

Australian Explosives Industry and Safety Group Inc. (AEISG) (2011) Prevention and Management of Blast Generated NOX Gases in Surface Blasting – Code of Good Practice.

14. Change Information

Version	Date	Change Summary	
1	October 2016	Update for MOD 5 Modification	
2	December 2019	Review of the template for all Lynwood management plans;	
		General structure updates;	
		Section 2 – Consultation;	
		• Section 3 – Statutory requirements – separate section;	
		 Section 4 – update to baseline information; 	
		• Section 5 – Addition of potential impacts section;	
		Section 7 – inclusion of responsibilities and timing for	
		controls. Additional controls added.	
		Section 10 – addition of adaptive management	
		information; and	
		 Section 14 – inclusion of change information. 	
		Ğ	
		The following did not change:	
		No change to monitoring or reporting requirements.	



