VULCAN MINE

Mine Operating Procedure

Drill and Blast Design

Contents

1. PURPOSE

This document covers the design-specific parameters, guiding principles, checklists, processes and procedures that govern all Drill and Blast design work in the open cut area at Vulcan Mine. The document also covers the roles and responsibilities of Technical Services and Operational personnel. An overview of the drill and blast design procedure can be viewed in Appendix A.

2. SCOPE

This procedure applies to all persons at the Vulcan Mine, including employees, contractors, service providers, and visitors.

3. DEFINITIONS

APP	MSEC1077 - Vulcan Complex - Asset Protection Plan for Aurizon Railway - Rev. 03
Cookbook	Stores all the drill and blast design parameters and track records of any changes (trials, improvements and history).
CMSHA	Queensland Coal Mining Safety and Health Act (1999).
CMSHR	Queensland Coal Mining Safety and Health Regulation (2017).
CMW	Coal Mine Worker.
KG	Kilogram
LOX	Line Of Oxidation
HST	Health, Safety and Training.
JHA	Job Hazard Analysis.
MIC	Maximum Instantaneous Charge
MOP	Mine Operating Procedure.
OCE	Open Cut Examiner.
PHMP	Principal Hazard Management Plan.
SSE	Site Senior Executive.
TARP	Trigger Action Response Plan.
TOC	Top Of Coal
TSD	Technical Services Department.
TSS	Technical Services Superintendent

4. Drill Plan Design

The Drill and Blast process uses Vulcan software for the CAD and drill pattern designs. Charge sheets and loading plans are executed in Excel. Timing plans use Blast Management Internation software, Blast Plan.

4.1. Drill area Demarcation

Drill and Blast Engineer to determine the blast extents and send through coordinates to the surveyor for set out. The surveyor is to mark out the given boundary for clearing and prep. The area has to allow for tail room on angle holes (typically minimum distance of 15m) and access for drill and blast crews.

4.2. Drill Prep – Clean up

The weekly plan communicates the drill preparation and enabling activity requirements to the production and mine services crew.

Figure 1. Drill Prep Requirements from Weekly Plan (230803)

The Drill and Blast Supervisor or Senior Shotfirer, must complete form VUL-FRM-16-04 Drill & Blast Pad Checklist. This form assesses the suitability of the drill prep and access for all equipment. This signed form is completed in the Mine Safety Culture, and a print out of the completed form is included in the blast packs.

4.3. Design Summary

The following is a guide to drill and blast design criteria currently used in Vulcan Mine:

- Electronic detonators are used for all initiation within a critical infrastructure for the purpose of control blasting. Non-electric detonators are also used in non-sensitive blasts or blasts located well away from a critical infrastructure. Heavy ANFO blend (40% EP) for bulk products. A pumpable (70% EP) blend is used for wet holes. Any changes to the blending needs to be reviewed and approved by Mine Manager.
- Alex overburden generally ranges in depth from coal daylighting out up to approx. 17m deep, with soft free-dig waste towards the LOX line to very hard sandstones.
- Dysart Lower (DL) overburden ranges from 20 to 55m thick, reducing thickness towards the LOX line, typically softer mudstone and siltstone.
- Dysart Lower Lower (DLL) overburden is generally 1.5 – 2m thick, reported as shallow and covered with hard siltstone material. Currently, it is not economical to mine due to poor coal yield.
- Matilda overburden in the Rocky Top is 24.5m on average, increasing in thickness toward the north west direction and reduces towards the LOX line. Oxidised sandstone on the natural surface down to more competent sandstone and into siltstone.

The table below gives a starting point for pattern specifications with parameters to be adjusted to suit the individual design as general rule try and have burdens greater than 4.3m to allow access along rows for blast crew.

Area	Drill Diam (mm)	Av Burden x Spacing (m)	B/S Ratio	Standoff (m)	Stemming (m)
Alex Production	158 mm	4.6 x 4.6 m	1.0	0.3 - 1.0 m	3.5 m
Alex Rubble	127 mm	4.3 x 5.0 m	1.16	0.5 m	3.5 m
DL Production (west)	203 mm	7.0 x 8.0 m	1.15	1.8 m	4.0 m
DL Production (east)	158 mm	5.5 x 6.3 m	1.15	1.5 m	3.5 m
DL Rubble	127 mm	4.5 x 5.0 m	1.11	0.5 m	3.5 m
DL Presplit	158 mm	2.5 m spacing		0.5 m	2.0 m

Figure 2. Initial Design Parameter

Generally, for the production blast, the powder factors range between 0.5 – 0.6 kg/bcm, assuming a 1.2kg/m^3 density bulk explosive is used. The powder factor may be adjusted due to change in ground conditions being harder than usual. Decking, confinement, timing, etc… may require change in powder factor to suit the condition.

4.4. Drill and Blast Cookbook

The Pattern Specifications is derived from the main drill and blast Cookbook. The Cookbook is saved in the following folder: T:\03_Vulcan_DnB\12_D&B Summary\Cookbook.

The drill and blast Cookbook holds the record of current drill and blast design parameters, and records of any changes for current and new pits. The Drill and Blast Engineer is responsible for managing the Cookbook.

4.5. Drill Design

Prior to designing the drill pattern, the extent of the blast needs to be established. Drill and Blast Engineer to liaise with the Production Mine Engineer to determine the blast sequence and upcoming areas that are to be blasted. The mine design pit shells and control files are filed and stored in the Vulcan directory.

Drill and Blast Engineer to fill out the VUL-FRM-16-05-Drill & Blast Design Assessment for each drill design.

The dig design shells and pit shells are provided by the Mine Planning Engineer. Avoid copying from previous pattern designs work folders as the design file may be obsolete.

The previous blasted points are stored in respective pit work folder. For example for Jupit Pit, **T:\03_Vulcan_DnB\01_JUP\vul_jup_blast_toes.dgd**.

The Strip and block lines are stored in respective pit work folder. For example for Jupit Pit, **T:\01_Vulcan_Design\01_JUP\07_vul_strip_block_lines.dgd**.

Once the blasting extents are determined, load the planned blast shell into Vulcan. It is easier to delete holes than add holes, so have boundary polygon for the entire area of interest. When determining the boundary and the pattern specifications, adjust this to get the final pattern as close as reasonable to the final result – this will reduce the re-work and fine-tuning later on.

Once the blasting extends has been finalised, determine the pattern parameters to use. The pattern parameter is set up in the blast specifications (Drill and Blast > Files > Specifications), which allows for multiple Pattern Specifications for burden, spacing, sub-drill, hole attributes, angle, etc… to be set.

When designing the drill holes, colours and collar icons provide details of different holes. This way they can easily be differentiated on the drill plan. Different colours can denote redrills, angles, or touch coal holes.

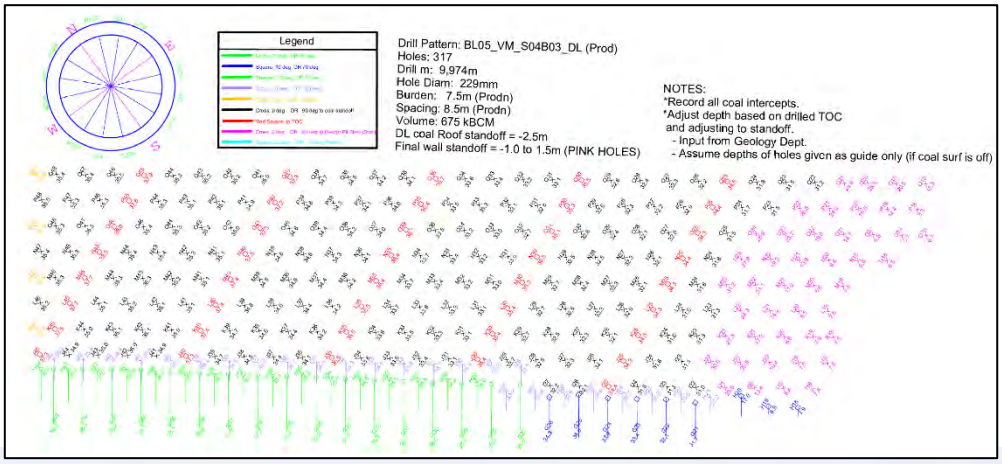


Figure 3. Example Drill Plan

Figure 4. Example Standard Drill Hole Legend

4.6. Drill Design - Pre Splits

When designing pre-splits, the power factor shall be between 0.6-1.0kg/m². Pre-split spacing is generally 2.5m and 3.0m, with a 158mm and 203mm diameter hole respectively. Any adjustment to the pre-split holes spacing should be reviewed, recorded and authorised by the Mine Manager. Ensure the correct boundary line and wall angle are used, usually 70 degrees in line with the final pit shell. Due to the angle holes, the tail room for the drill is critical – Allow for a minimal distance of 15m tail room so drills can tram off the hole and reposition to the next hole.

Once the correct alignment is determined, use the create holes along line function in Vulcan to generate the presplit design. Due to final wall following road some adjustment is likely required to presplit holes on bends.

4.7. Drill Design - Rubble

The rubble zone is designed to be fired ahead of the production holes and give a zone of broken ground to reduce vibration between the main pattern and sensitive sites. This is generally drilled with 127mm and 158mm holes on a tighter burden and spacing. If the rubble is against a presplit batter ensure any holes that would intercept the batter are adjusted to standoff.

4.8. Back Wall treatment

The current options based on allowable wall designs in Geotech procedure are for either a softwall (45 – 50 deg) or presplit wall (70 deg).

For softwall batter leave vertical holes along the back wall to target lower drill surface to encourage a batter of blasted material.

If the final wall is a presplit batter depending on the pattern ahead of this there is generally the following options – drill all holes in the pattern at the same dip, drill the back row at the same dip as presplit and then transition to vertical in the production holes or drill stab holes to pickup presplit (if the drill bench is below the crest of the presplit this may require stab holes back towards the presplit or precondition from the shot above).

4.9. Blast Specifications

Setup in the blast specifications (Drill and Blast > Files > Specifications) for the desired parameters for the blast. Under the Pattern Specifications there can be multiple specifications for burden, spacing, subdrill, hole display, angle, etc… to be setup.

Note that is easier to delete holes later then add holes so have boundary polygon for the full area of interest. When determine the boundary and the pattern specifications adjust this to get the final pattern as close as reasonable to the final result – this will reduce the amount of fine tuning later on.

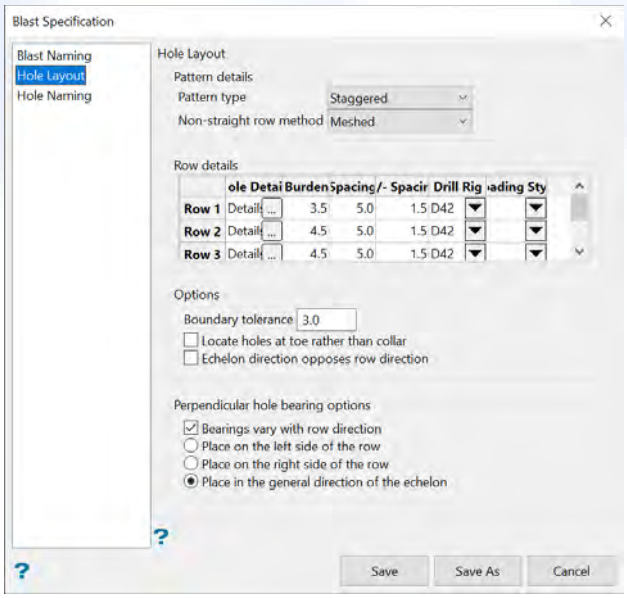


Figure 5: Blast Editor Tool – Blast Specification

The "Hole Layout" sets parameters the used to generate the shot. Generally, this will be a staggered pattern. The non-straight row method only comes into play if you want rows to follow a curve (e.g. the rubble zone following the final shell), but the preference is to keep straight rows.

The Row Details allow you to set the hole bearing, angle, dip, collar, toes, and etc… as well as individual burden and spacing. The last row entered in this table will then be applied for any remaining pattern if more then one is entered. Use the +/- Spacing only if for rows that are not straight.

Boundary Tolerance is useful to add holes that would just fall outside the boundary – these holes can then be adjusted or deleted if not required when editing shot.

A boundary polygon will be used to define pattern extents. Other options are also available to generate along lines (this option will use the spacing from the selected Blast Specification for presplit holes, and for double stitching face) or at object points.

When generating a blast, the name will be used as the default for exporting, also this can used by some gps and blasting software so is worth entering the name of blast here appropriately.

4.10. Design Considerations

Key points to consider during the drill design stage:

- Pre-empt the Tie up plan given the geometry of the blast, and design the drill pattern accordingly. This will help with doing Tie up in the later stage.
- How does this tie into surrounding shots – avoid drilling into blasted ground or leaving too much burden between shots (ideally 4m to 7m from previous hole toe to new hole toe). If blasting coal then the offset distance can be more than 10m.
- Check face burdens are greater than half the row burden
- Avoid drilling into previous holes from above. See “Blast toe Layer” and “Offset Layer” below
- Is the current highwall a soft wall or hard wall, check face burdens by creating a section plane perpendicular to the open faces and shifting the section along the shot
- What is the desired new highwall / end wall – is this a soft wall, hard wall (stab batter) or presplit and ensure pattern is adjusted for this. If drilling stab holes against a presplit or hard batter ensure the holes are designed to this with correct standoff – if TOC surface is used will soft wall this batter
- Standoff and subdrill. Check standoffs to TOC are correct and any stab holes to a presplit batter
- Check the holes display complies to the drill legend (critical to identify the planned angle, if touch coal, depth etc)

4.11. Printing Drill Plan

Before printing setup, a text layer. The easiest option to copy text layer from prior blast and rename. To get details for the design export a report (Drill and Blast > Analysis and Reporting > Reporting)

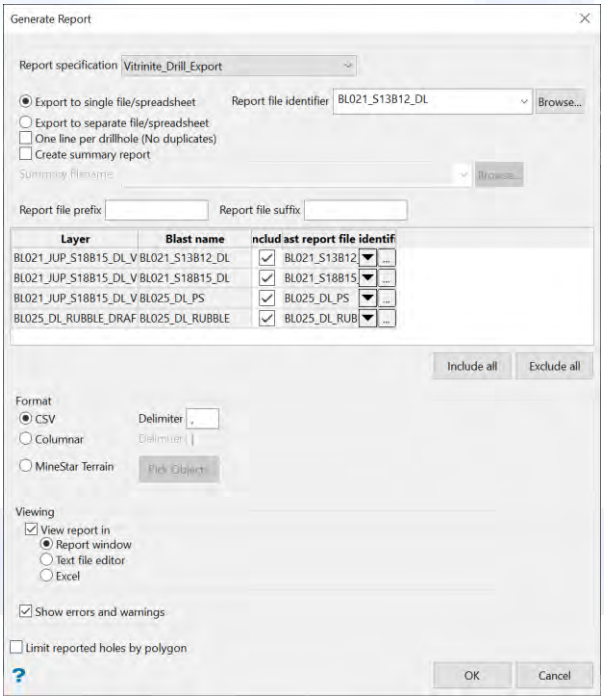


Figure 6: Blast Editor Tool – Generate Report

The text layer will have a drill legend, compass and text to indicate the details of shot. Copy this later from an adjacent shot, rename and update based on the exported csv file.

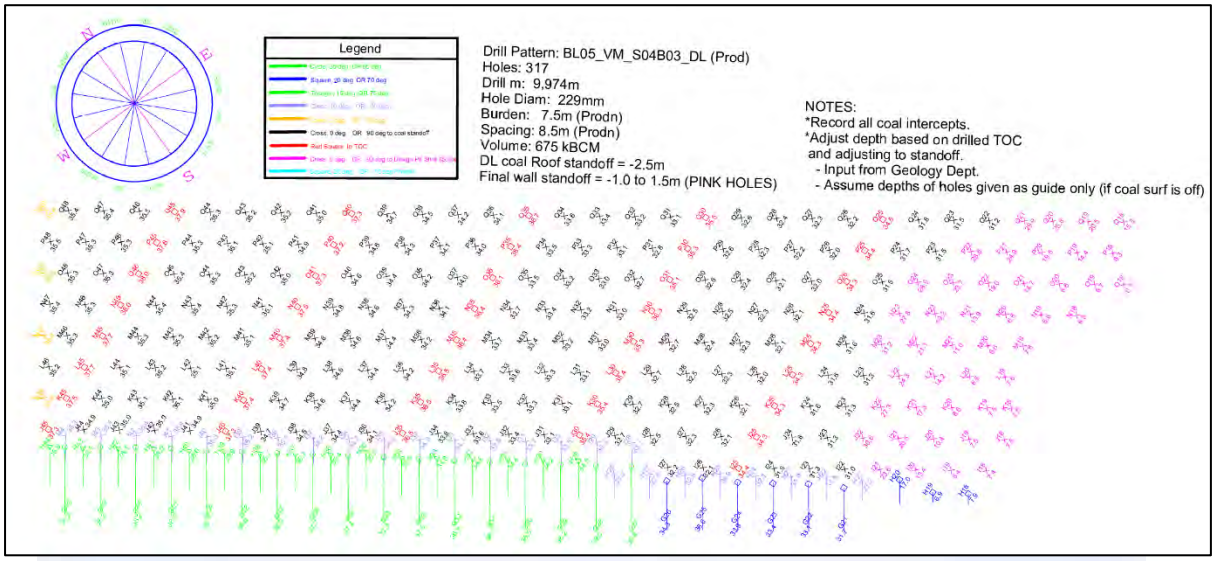


Figure 7: Drill Plan in Vulcan with text layer

To create a pdf of the drill pattern, generate a plot. Use the Drafting Sheet *VIT_A3_LAND*. When creating plot fill the page with the drill pattern orientated with new highwall at bottom of page.

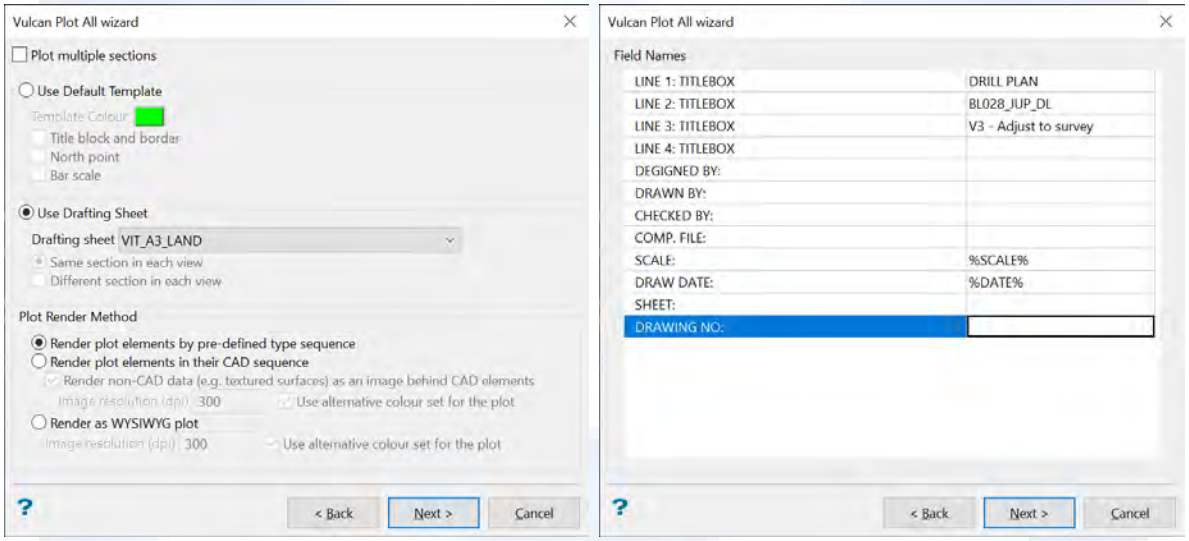


Figure 8: Plotting in Vulcan – Filling in Title Box

Print an overview plan of the full blast pattern. If the scale used for this is any greater than 1:700 print further pages using a smaller scale. Plotted plans must be clear and easily read by the user.

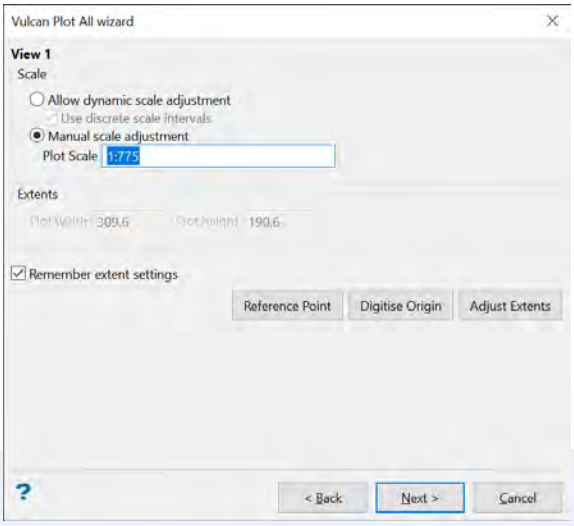


Figure 9: Plotting – Scale and Setting

4.12. Traffic Management Plan

A Traffic Management plan is required as part of the Charging and Firing Explosives SOP (VUL-SOP-116g). The traffic management plan is completed by the shotfirer and attached to the individual blast JHA. It is to be reviewed prior to the commencement of loading each shift, considering the load plan for the day. The LV Park up and drill access for the drilled pattern is considered as part of the Drill and Blast Pad Checklist (VUL-FRM-16-04).

A template has been setup for the traffic management plans *VIT_A3_DANDB_TMP*. This plan is attached to the VUL-FRM-16-23-DBA Traffic Management Plan Cover Sheet and handed over to the responsible Shotifrer by the Drill and Blast Engineer.

4.13. Key Deliverables for Drill Plans

For drilling to commence the following are required:

- Attached copy of approved drill and blast design checklist - VUL-FRM-16-05 Drill & Blast Design Assessment
- Approved drill design (authorised by responsible persons)
    - Clear instructions for drillers included in drill plan
        - for example, drilling touch coal first and not to infill.
    - Includes all required information for drilling - Note Bearings, hole angles, additional information.
    - If holes are not to be drilled or are yet to be released exclude these from the survey file and only include those holes to be drilled.
    - Survey set out file exported as a csv. Headings, comments, and additional columns are removed to leave only values for the following fields for import to Trimble GPS.

Hole ID	Collar X	Collar Y	Collar Z

5. Charge and Fire Plan

5.1. Face Burden Checks

Face burden checks to be considered prior to issue the drill plan based on latest survey data. Holes should be no closer than half a burden to a free face to avoid face burst. If closer than half a burden, Drill and Blast Engineer to liaise with shotfirer as to how to appropriately load hole. Shotfirer to approve load sheets, and a risk assessment conducted if loading of these holes commences.

5.2. Charge Surfaces – Including TOC

Touch coal data reviewed from drilling logs. This data is imported to Vulcan to generate a drilled TOC model. This is compared to the geological model, or survey data on prior strips for sense checking. Large variations are reviewed with appropriate persons, mainly the Mine Geologist and Mine Planning Superintendent. Generally, touch coal data is preferred over the geological model. Load sheets updated to reflect most current target depths. If the stand-off above the coal is bigger than expected, it should be reported to the Mine Planning Engineers/Superintendent and Mine Operation Superintendent.

5.3. Standard Loading Parameters

This will be per Material Type Per Horizon, PF Targets, stemming lengths, etc.

Shot type	Powder Factor	Stem Length	Explosive Product	Comments
Production	0.5-0.6kg/m^3	Minimum 2.5m – All stemming material (20mm-30mm) depending on hole diameter	40-60 HANFO, 70-30, Pumped if wet holes	Rule of thumb for stemming size – 10% of hole diameter.
Pre split	0.6-1.0kg/m^2	• 4m. Sandy material preferred • Air decking (no stemming)	40-60 HANFO subsequent decks, Toe charge 70-30 Pumped	• Up to 2 decks (from natural surface to DL coal) • Normally 35kg single deck per hole in Rocky Top.
Rubble	0.35-0.40kg/m^3	Minimum 2.5m – All stemming material (20mm-30mm)	40-60 HANFO, 70-30, Pumped if wet holes	Decking of each hole to control blast vibration.

Figure 10: Standard Loading Parameter

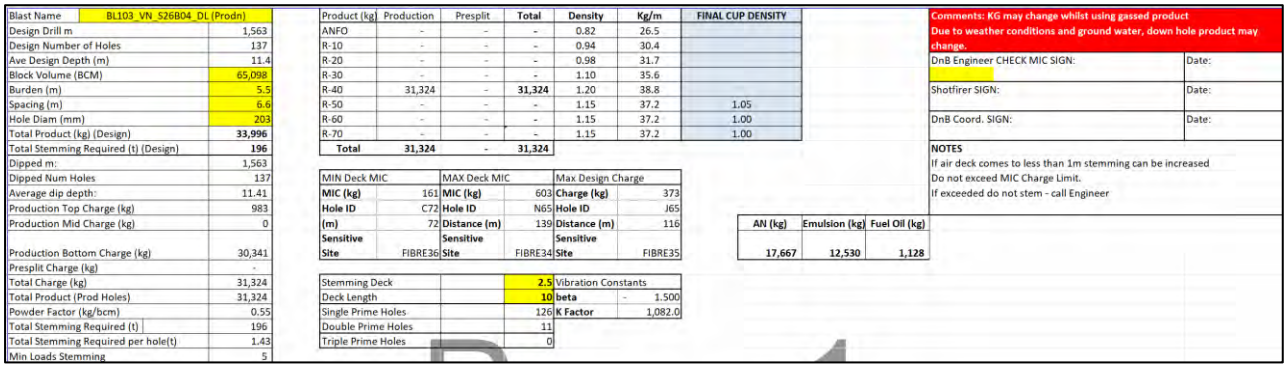
5.4. Load Sheets

Load sheets are created from the load sheet template. The Hole number, design depth and dipping information are included along with the product type and kilogram of explosives per hole. They also include the column charge length and required stemming height. A charge limit is also calculated, which is the lesser of +10% of the designed explosives or MIC.

The MIC is based on a calculation of distance from each hole's collar to the sensitive site and the maximum vibration at the site. The MIC applied to the hole is the minimum for all sites calculated from that hole.

As per VUL-SOP-116g Charging and Firing Explosives - A margin of 10% may be added to achieve stem height, unless in a MIC sensitive area. Any variance greater than 10% from design shall be discussed with Drill and Blast Engineer prior to continuation of loading. Variation shall be recorded on load sheet and load map.

A summary is included at the beginning of the load sheets. This includes MIC, total stemming requirements, number of holes, design powder factor, prod split, explosive density targets. A sign off is also included.



Blast Name	BL103_VN_526B04_DL (Prodn)
Design Drill m	1,563
Design Number of Holes	137
Ave Design Depth (m)	11.4
Block Volume (BCM)	65,098
Burden (m)	5.5
Spacing (m)	6.6
Hole Diam (mm)	203
Total Product (kg) (Design)	33,996
Total Stemming Required (t) (Design)	196
Dipped m:	1,563
Dipped Num Holes	137
Average dip depth:	11.41
Production Top Charge (kg)	983
Production Mid Charge (kg)	0
Production Bottom Charge (kg)	30,341
Presplit Charge (kg)	-
Total Charge (kg)	31,324
Total Product (Prod Holes)	31,324
Powder Factor (kg/bcm)	0.55
Total Stemming Required (t)	196
Total Stemming Required per hole(t)	1.43
Min Loads Stemming	5

Product (kg)	Production	Presplit	Total	Density	Kg/m	FINAL CUP DENSITY
ANFO	-	-	-	0.82	26.5	
R-10	-	-	-	0.94	30.4	
R-20	-	-	-	0.98	31.7	
R-30	-	-	-	1.10	35.6	
R-40	31,324	-	31,324	1.20	38.8	
R-50	-	-	-	1.15	37.2	1.05
R-60	-	-	-	1.15	37.2	1.00
R-70	-	-	-	1.15	37.2	1.00
Total	31,324	-	31,324			

MIN Deck MIC		MAX Deck MIC		Max Design Charge	
MIC (kg)	161	MIC (kg)	603	Charge (kg)	373
Hole ID	C72	Hole ID	N65	Hole ID	J65
(m)	72	Distance (m)	139	Distance (m)	116
Sensitive Site	FIBRE36	Sensitive Site	FIBRE34	Sensitive Site	FIBRE35

Stemming Deck		2.5	Vibration Constants	
Deck Length		10	beta	1.500
Single Prime Holes		126	K Factor	1,082.0
Double Prime Holes		11		
Triple Prime Holes		0		

AN (kg)	Emulsion (kg)	Fuel Oil (kg)
17,667	12,530	1,128

Comments: KG may change whilst using gassed product
Due to weather conditions and ground water, down hole product may change.

DnB Engineer CHECK MIC SIGN:	Date:
Shotfirer SIGN:	Date:
DnB Coord. SIGN:	Date:

NOTES
If air deck comes to less than 1m stemming can be increased
Do not exceed MIC Charge Limit.
If exceeded do not stem - call Engineer

Figure 11: Load Sheet summary example

Once the load sheets are created. The charge sheets are saved in the blast folder "4.0 Load and Charge Sheets" under the relevant blast. The load sheets are also stored with the blast packs.

In accordance with VUL-SOP-116g, Loading shall not commence without authorised Load Plans and exclusion zones issued to blast crew and OCE.

5.5. Tie in Design

Prior to designing the tie-in consideration for vibration control, mining direction, flyrock, fragmentation, rock properties, free-face, etc…. To ensure good fragmentation, there needs to be relief. This can either be done via horizontal movement, vertical movement or a combination. There are numerous design options that can be considered for tie-ins. The typical tie-ins that are used at Vulcan are:

- Diamond (centre lift)
- Zipper (centre lift)
- V (Free face)
- Straight Echelon (Free Face)
- Presplit (Wall control)

Tie-in must be reviewed and authorised by responsible person prior to release to blast crew. The PPV analysis for nearby infrastructure and surrounding mines must be conducted to ensure compliance to required limits. This includes analysis from a third-party blasting consultant when mining plans are changed, periodic auditing or the blast design involves abnormal complexity such as being close to infrastructure.

5.6. Notifications

5.6.1. Loading Notification

VUL-SOP-116g Charging and Firing Explosives

- Lightning exclusion zones to be demarcated prior to loading.
- Loading notice is issued a minimum of 24hrs prior to commencing of loading.

5.6.1. Firing Window

Blast firing window to be determined based on expected loading and tie up ready for firing, favorable weather forecast, and consolation with impacted neighbors.

5.6.2. Blasting Notification

Once firing window has been determined the Blast Notification will be issued, this will detail the blast location, expected firing date and time, weather forecast and fume zone.

Blast notice to be issued a minimum of 24hrs prior to forecast blast time. This also includes any blast notice for Misfire.

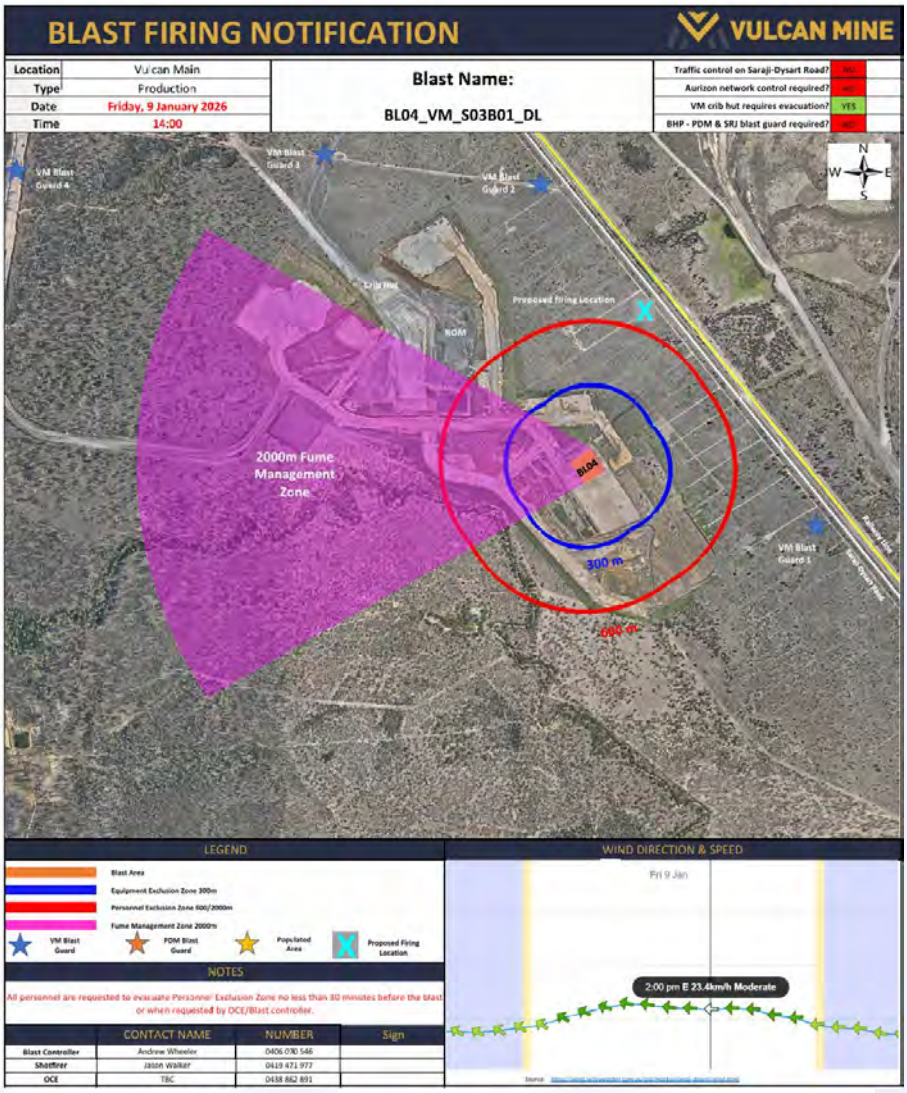


Figure 12: Standard Blast Notification

5.6.3. Misfire Notification

The Drill and Blast Engineer sends a Misfire Notification to site wide as soon as a misfire has been reported. The Mine Surveyor picks up the misfire location and establishes the ten (10) meter stand-off delineation reference pegs for the blast crew.

Misfire information is saved in the following directories: T:\03_Vulcan_DnB\16_Misfire_Reports_Register, and for Vulcan files, T:\03_Vulcan_DnBA copy of the Misfire Notification is posted on the respective notice boards and taken down once the misfire has been cleared.

The Drill and Blast Coordinator/Senior Shotfirer creates a Misfire pack to ensure all relevant documents are kept in the folder.

For convenience, seek approval from SSE and relevant managers to establish a misfire disposal area within the mining lease. The area identified should be well away from the traffic and work areas – at least 600m for personnel clearance zone.

Figure 13: Designated Misfire Disposal Area

5.7. Vibration Control

As per the MSEC1077 - Vulcan Complex - Asset Protection Plan for Aurizon Railway - Rev. 03, The blasting areas will be controlled to limit the vibration along the Railway and at key rail infrastructure including the: concrete footings and foundation bedrock supporting the masts, bridge abutments and other infrastructure; cuttings and embankments; and high voltage powerlines including the overhead cables, insulators, transformers and safety switches. A summary of the proposed vibration criteria for the key railway infrastructure is provided in Table 3.1 (after H&P, 2020). These criteria are based on international literature and field studies, Australian and international standards and best practices.

Table 3.1 Proposed vibration criteria for the railway infrastructure (H&P, 2020)

Infrastructure element	Proposed value (mm/s)	Comment
Railway corridor (insulators, masts, sleepers, etc.)	150	Conservative value
Transformers	60	Elevated values possible based upon clarification of transformer susceptibility
Cuttings	80 (with geotechnical assessment)	Higher permissible values likely based upon geotechnical assessment
Embankments	Geotechnical assessment	No requirement for vibration criteria face angles less than 60 degrees
Culverts	150	Higher permissible values likely based upon geotechnical assessment
Communications	40	Higher values possible based upon clarification of communications infrastructure
Bridges	80	-

Figure 14: Vibration Limits

These vibration limits are maximum and as such blasts are designed a lower value to allow for a factor of safety.

Load sheets set the individual hole limits for MIC. This data is then exported to form part of the tie in design to account for the firing sequence and charge arrivals at sensitive sites.

5.8. Key Deliverables for Charge And fire Plans

- Backfill plan with clearly articulated backfilling hole depths and hole numbers
- Signed off load sheets
- Timing and string plan

6. Quality Assurance/Quality Control

6.1. Explosives Density

Explosives density is outlined in the load sheets per shot. The MPU operator to conduct at least one (1) on bench density check for each load if pumping gassed emulsion blends.

These density checks are relayed through the daily MPU sheets to the shotfirer and subsequently the Drill and Blast engineer for review.

6.2. Hole depth compliance

Once holes are drilled, Drill and Blast Engineer to review daily drilled metres compared to design and identify inconsistencies and variances. After the shot has been drilled, blast crew to dip and log the shot and return information to Drill and Blast Engineer.

All holes are to be checked to ensure they have been drilled to design pattern (diameter, bearing, angle, burden, spacing & depth) with appropriate front row burden and suitable for loading. Record pattern variations on loading map sheet and notify Shotfirer and Drill and Blast Engineer.

6.3. Charge and Stemming length spot auditing

Holes shall be bobbed during the loading process to the extent that the Shotfirer is sure that:

- The correct stem height is achieved.
- Stem height to be adjusted to allow gassing of product (if used).
- Maximum Instantaneous Charge (MIC) parameters have not been exceeded. Where shots are governed by the Asset Protection Plan a third-party review is required.

If Shotfirer is not bobbing holes alongside the MPU, they will spot check 10% of the holes. This is to ensure explosives gassing correctly and that KG. Shotfirer in accordance with MPU operator decides whether or not the 10% additional explosives is required, in line with the load sheets.

D&B engineer to review design versus actual usage of explosives.

6.4. Vibration Monitoring

- Set up blast monitors prior to the blast, at appropriate locations.
- After blast has fired, vibration monitors are retrieved and results reviewed by Drill and Blast.
- Modelled vs Actual to be reviewed and results emailed out.
- If exceedance report to SSE, General Manager and other relevant parties.

An account has been created with Honeycom (https://honeycomb.omnidots.com) which has the platform to record and interpret all the vibration monitoring data. Log in details can be obtained from the Drill and Blast Engineer.

6.5. Daily Data

Daily as the data is provided from blast crew the following needs to be updated:

- Daily Drill Info:
  - Any touch coal that is drilled is to be exported into Vulcan software for generation of TOC model.
  - Any temperature check data if loading in known reactive ground conditions or as per request from Drill and Blast Engineer.
- Daily Bulk Loading
- Daily Explosive Manifest – Shotfirers reports
- Stock deliveries
- Load sheet updated with daily dip data

Stocktakes of the magazine and reload are completed weekly by shotfirers, this information is then reported through to the Drill and Blast Engineer at the start/end of swing.

7. Blast Pack – Blast Crew

Purpose for creating a Blast Pack for the Drill and Blast crew is to ensure all the relevant hard copies of paper work such as load sheets, blast summary sheet, shotfirer's daily reports, JHA, etc… are stored in once place.

After a shot is fired, the shotfirer responsible ensures all the relevant documents are place in the Blast Pack before handing it over to the Drill and Blast Engineer. The Drill and Blast Engineer records and stores the Black Pack.

Copy of the Blast Pack checklist can be found in the folder: T:\03_Vulcan_DnB\09_Templates\05. Blast Pack Checklist.

BLASTPACK CHECKLIST VULCAN MINE COMPLEX			
Shot ID:	**Load Start Date**		
Particulars	**Yes**	**No**	**Comments**
1 x copy of Drill Blast Pattern Checklist			VUL-FRM-16-04
Drill Blast Design Assessment Completed			VUL-FRM-16-05
Copy of Drill Plan (A3)			
Dipping Information (A4)			
Copy of Redrill Map (A3)			
Backfill sheet issued (A4)			
OCE notified			
5x Copies of On-Bench Toolbox Talk (A4)			VUL-FRM-16-16
1 x Copy of blank JHA (A4)			VUL-FRM-02-03
Geotech Hazard Identified/Map			
1 x Copy of DBA Traffic Management Plan			VUL-FRM-16-23
Designated LV Park up Established			
Delineation/Flashing Lights/Pyramids established			
4 x Copies of Loadsheet (A3)			
3 x Copies of Tie up/String Plan (A3)			
1 x Wireup Summary Sheet (A4)			
2 x Copies of Blast Maps (A4)			
1 x Copy Blast Firing Notification (A4)			VUL-FRM-16-22
1 x Copy of Blast Controller Checklist (A4)			VUL-FRM-16-02
MPU dockets			
Blast Summary Sheet			
Any Unusual Circumstances?			
Responsible Shotfirer:	**Date of Blast:**		

Figure 15: Information of Blast Pack

8. File Storage Data Structure – Work Folder -

All Drill and Blast design locations are found in the following location:

- T:\03_Vulcan_DnB\XX_XXX\Blast XXX

Each blast is saved into its own folder based on naming convention: For instant

- BLxxx_JUP_SxxBxx_Horizon – where

BLxxx – is blast design number

JUP – the pit (2 to 3 characters)

Sxx – strip number, where multiple strips crossed use the SW strip number

Bxx – is the block number, where multiple blocks are crossed use the SW block number

Horizon – is the seam the shot is to target, either DL, DLL, ALEX or Matilda

When creating a new blast make a copy of the following folder into the directory above and rename according to the convention. This will give the file structure for blast and some files to start.

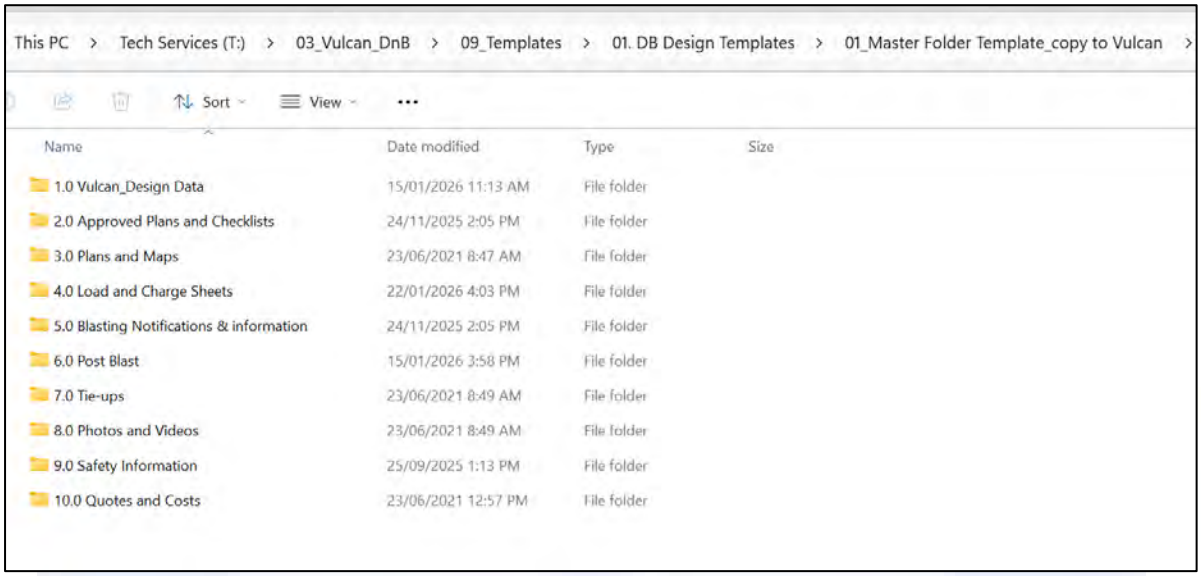


Figure 16: Master Folder Template Layout

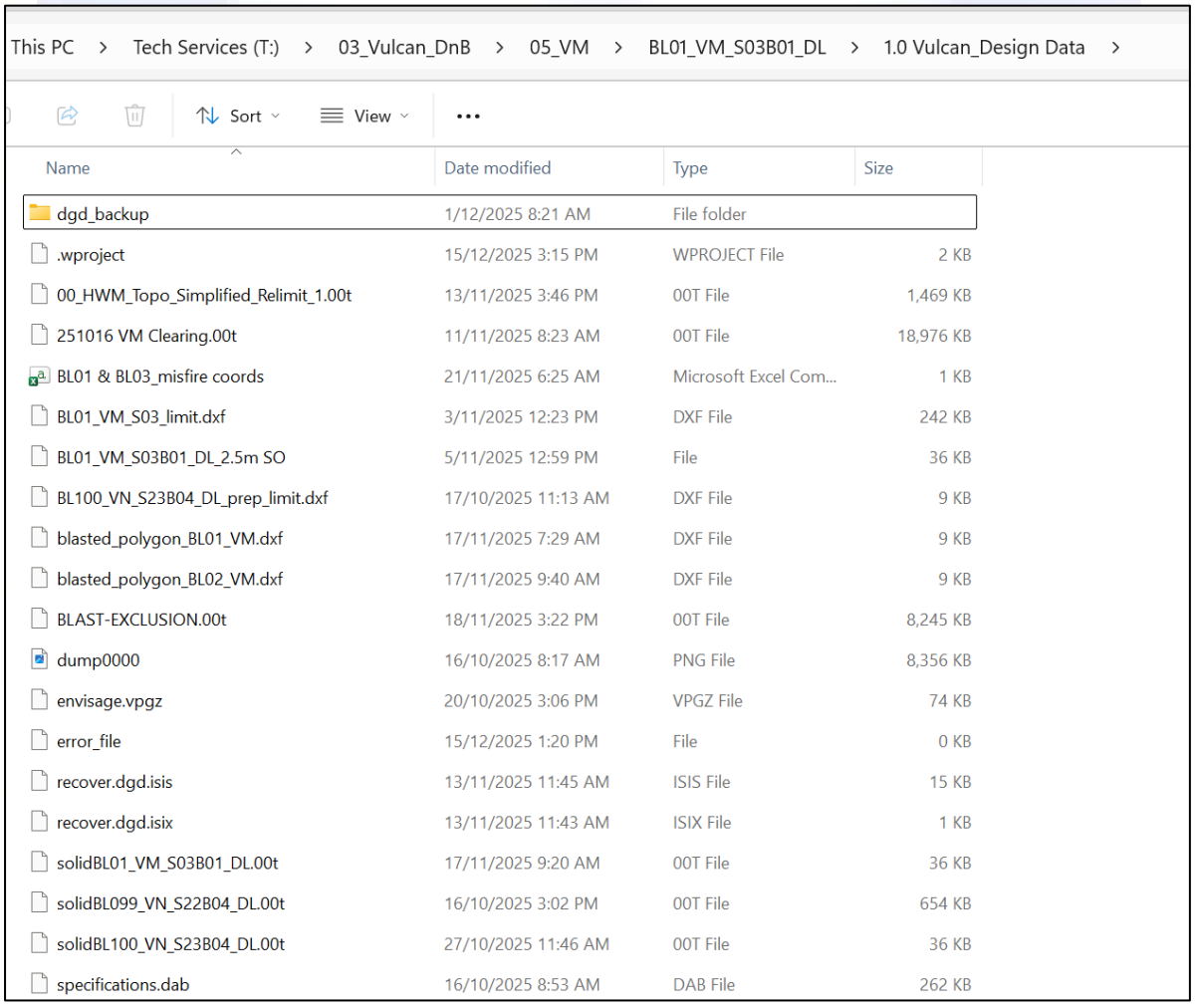


Figure 17: Vulcan Wok Folder

All Technical data is then saved in the appropriate location under the blast, with this selected as the working director for Vulcan.

9. ROLES AND RESPONSIBILITIES

SSE	Shall review and approve this procedure.
HST Superintendent	Shall ensure that all provisions of this procedure are implemented, and that compliance is achieved.
Managers/Superintendents	Shall be responsible for their area of operations and the implementation and application of this procedure; Provide adequate training, information, structure and supervision to ensure that this procedure is implemented; Carry-out a periodic review of activities to ensure the appropriate application and understanding of this procedure; and Ensure immediate and appropriate steps are taken to investigate and rectify any risks to health and safety arising from these activities.
Supervisors	Ensure all CMWs are familiar with, have access to and comply with the requirements set out in this procedure.
All CMWs (including visitors and contactor)	Shall comply with the requirements of this procedure.

10. REFERENCES

- Coal Mining Safety and Health Act 1999 (Qld)
- Coal Mining Safety and Health Regulation 2017 (Qld)
- Explosives Act 1999
- Explosives Regulation 2017
- AS 2187 Safe Use & Storage of Explosives
- Australian Explosive Code (AEC)
- Australian Code for the Transport of Explosives by Road and Rail.
- Australian Dangerous Goods (ADG) Code
- Information Bulletin 53

11. REVIEW

This document shall be reviewed at minimum two yearly, or as follows:

- when there is a change of method and/or technology and/or legal or other requirement that may affect the accuracy of this document;
- when operational changes occur that effect the currency of the document;
- when there has been a significant event to which this document was relevant; and
- as a result of relevant audit findings.

12. DOCUMENT CONTROL

Version	Date	Description	Document Controller
01	18/10/2023	Draft creation and cross section review	Kelly Jensen
02	03/02/2026	Review & Update	Kelly Jensen

Appendix A. Flow Chart For Drill and Blast Design