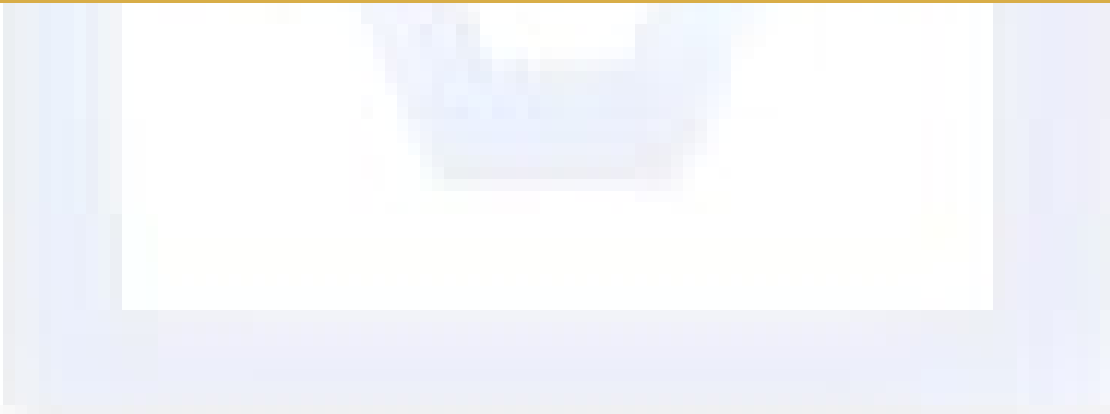




VULCAN MINE



Standard Operating Procedure Spoil Dumps Excavated Faces





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1. PURPOSE

The purpose of this procedure is to describe requirements and to effectively manage hazards and risks associated with working in on product spoil dumps or near excavated faces, at the Vulcan Mine.

This procedure has been developed to ensure compliance with section 117 of the CSMHR.

2. SCOPE

This procedure is applicable to all persons at the Vulcan Mine including employees, contractors and visitors.

The controls within this procedure are mandatory.

3. DEFINITIONS

Authorised Person	A person who has the required competencies and who has been appointed by the Site Senior Executive to carry out a designated scope of duties.
BBRA	Broad Brush Risk Assessment.
CMSHA	Queensland Coal Mining Safety and Health Act (1999).
CSHR	Queensland Coal Mining Safety and Health Regulation (2017).
CMW	Coal Mine Worker.
Competent Person	A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform correctly a specified task.
FOPS	Falling Object Protection System.
HME	Heavy Mobile Equipment.
HSET	Health, Safety, Environment and Training.
JHA	Job Hazard Analysis.
OCE	Open Cut Examiner.
PHMP	Principal Hazard Management Plan.
ROP	Roll Over Protection.
SHMS	Safety and Health Management System.
SOP	Standard Operating Procedure.
SSE	Site Senior Executive.
Take 5	Personal Risk assessment.
TARP	Trigger Action Response Plan.
TSD	Technical Services Department



4. PROCEDURE

4.1. Process Definitions

Body	The main mass and depth of a safety bund.
Catch Berm	A berm of sufficient size to arrest material which may fall from a spoil dump or soft wall.
Drop Zone	Distance from the toe of a batter where a rock may directly hit or slumping may impact, e.g. 10 metres from most high walls.
Dump	Designated area for waste material to be placed.
Excavated Face	Any highwall, soft wall or face that permits an object or person to free-fall.
Exclusion Zone	No equipment or personnel shall enter this area at any time unless under a specific risk assessment.
Fundamentally Stable	A condition where a vehicle will not move from its parked position in the absence of brakes and whilst in neutral gear.
Safety Berm	Any road where the edge or shoulder has a drop off that exceeds 0.5 metres shall have protective berms that are sufficient to stop any vehicle travelling that road. Safety berms shall be constructed to sufficient dimensions and of a material competent to prevent a loaded heavy vehicle from passing through the berm and over an edge. A specific site risk assessment supported by technical data may be required to determine alternative dimensions. Safety berms can also be known as a bund.
Spoil Dump	Includes all dragline spoils, overburden and interburden dumps.
Stockpile	A supply of material that is held for future use, e.g. coal, topsoil, basalt.
Width	The depth of a safety bund.
Working excavated face	An active excavated face is determined if a machine is located on or at the bench or dig face. These working areas are controlled by a hard barrier and “restricted access signage”. If a machine is moved away from an active dig face, a hard barrier shall be placed on all excavated faces or access roads leading to an open face before the restricted area signage is removed.

4.2. Routine Inspection

The OCE is required to conduct regular inspections of the mine-site, including spoil dumps and excavated faces, throughout the shift to identify hazards or unsafe work practices. If unsafe conditions are observed, the OCE is to notify the supervisor and other relevant personnel, place signage and/or barricades to notify CMWs of the unsafe conditions, rectify the problem where possible, or conduct a risk assessment if required.

When referring to geotechnical hazards on the OCE report, an individual geotechnical hazard number is to be referenced. The OCE is to complete photo documentation of geotechnical hazards and maintain written record of tell-tale movements. Geotechnical inspections are detailed in the VUL-PHM-003-Geotechnical PHMP.

The supervisor is required to conduct regular inspections, test and verify critical controls relating to the work areas under their control and respond to identified hazards as per OCE. The supervisor should also inform the OCE of unsafe conditions or acts observed.

Operators shall continually monitor their work area for hazards and notify other personnel in the area, their supervisor and OCE of any observed hazards, unsafe conditions or changes in their work area.



4.3. Discharging loads on Spoil Dumps

Procedure for discharging loads from fixed and mobile plant can be found in VUL-SOP-133– Discharging Loads from Fixed and Mobile Plant

4.3.1. High Dumps

For any dump or tip head over the height of 30 metres, geotechnical advice must be sought prior to utilising the area. Control measures will be communicated by the Technical Services Department, if required, to guide the activity of dumping at height of greater than 30 metres.

4.4. Control Measures

4.4.1. Critical Controls

A BBRA was conducted on the unwanted events of:

- loss of stability of high wall;
- loss of stability of box cut; and
- loss of stability of benches, spoil dumps and low walls.

From the BBRA, the following critical controls were identified:

- training competency and supervision;
- design criteria; and
- compliance to geotechnical hazard controls.

4.4.2. Operational Controls

Controls shall be developed and implemented for the effective and efficient implementation of the mine design. These should be developed in consideration of:

- Identification of hazards and assessment and control of risk to acceptable levels.
- Development and implementation of appropriate organisational systems, including:
 - SOPs;
 - geotechnical hazard communications;
 - critical geotechnical monitoring reports;
 - critical control effectiveness monitoring;
 - hazard identification competency and processes; and
 - risk assessment and control.
- Review of geological historical data and pit specific geotechnical advice.
- Allocation and communication of functions and tasks.
- Competency of personnel, e.g. hazard identification and monitoring.
- Provision of physical barriers, e.g. minimum stand-off distance from walls, provision of FOPs on machinery.
- Identification of hard/fill interaction areas, e.g. surveyed and demarcated.
- Design of appropriate batter angles for fill and soft wall batters and allow sufficient room for catch berms.

4.4.3. Process Controls

The following controls shall be developed and implemented to ensure the design is deployed as intended:

- Up-to date mining strip layout plans, dig plans, hazard plans, construction drawings, e.g. ramps.
- Survey set-out and GPS control where possible.
- Guidance on spoil placement and spoiling sequence.
- Mining sequence animation, e.g. 3Ddig, mud maps.
- Operating procedures – including SOPs and PHMPs.
- Water management and drainage.
- Survey compliance to plan scans.



4.4.4. Mine Operating Plans

Up-to-date known and suspected mining hazard information shall be clearly shown on mine operating plans, utilised by operational personnel to communicate the presence of hazards and the planned mode of operation to prevent or minimise exposure to the hazard.

4.5. Working Below an Excavated Face or Spoil Dump

The wall of any excavation or spoil dump shall be maintained to minimise exposure to hazards as far as practicable. This may be achieved by:

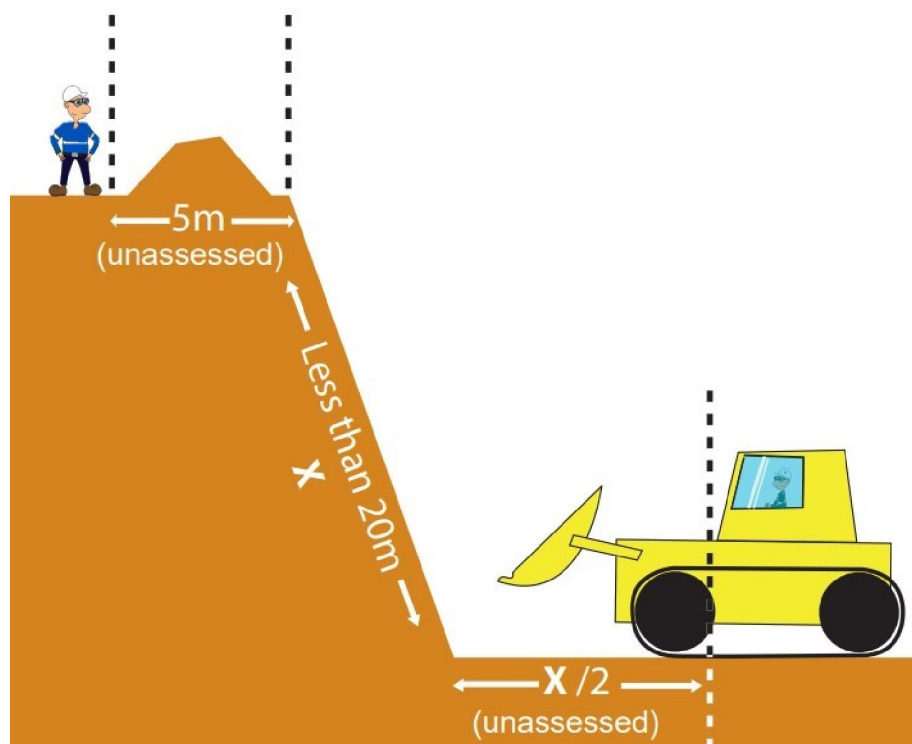
- Following approved site dig plans.
- Scaling the wall to remove loose material.
- Benching or battering the wall.
- Establishing catch berms at the toe of soft walls/fill material (including spoil piles) that allow the material to fail in a controlled environment.
- Establishing a water management system (e.g., diversions, pumps, drainage gaps in highwall bunds to prevent ponding, etc.).
- Restricted access to non-working areas.
- Highwall-bund 5m from crest for OCE access/inspections.

To determine the exclusion zone for coal mine workers (including those that are in cabs) working below an excavated face or spoil dump that exceed 45degrees (1:1), the following criteria shall be used:

- 5m from any crest.
- Half the face height from the toe of an excavated face less than 20m high.
- 10m from the toe of an excavated face between 20m and 60m high.
- A minimum 5m exclusion zone shall apply to all advancing spoil dumps.

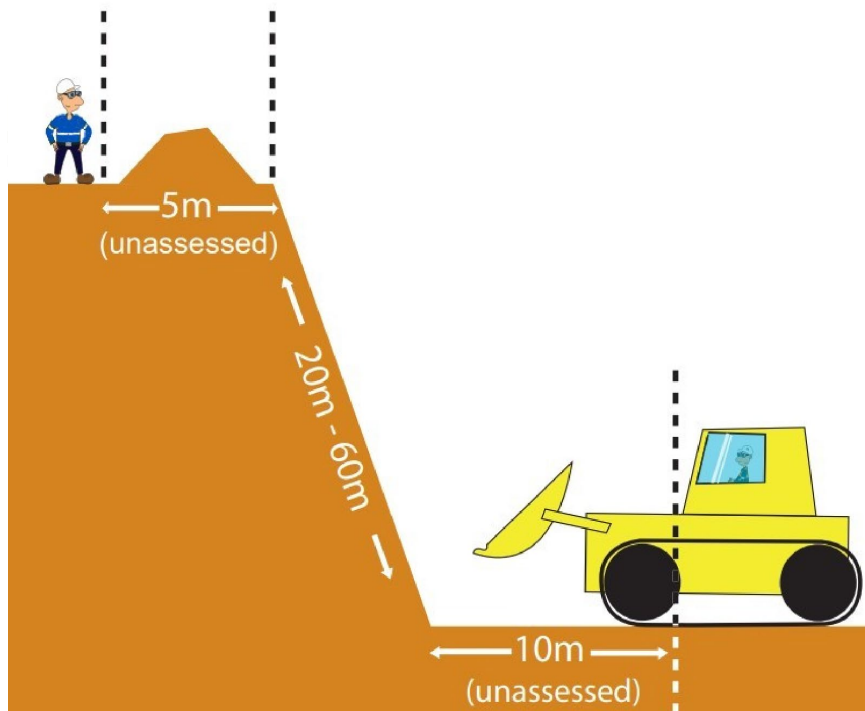
To demarcate the exclusion, zone a 1m bund must be established at the toe of all highwalls and spoil dumps. This bund must be maintained to within 50m or less of the active dig areas.

Slope at or steeper than 45° and less than 20 metres continuous height





Slope at or steeper than 45° and 20m – 60m continuous height



To manage material that is inside the exclusion zone, ancillary excavators and/or wheeled loaders that have a reach equal to or greater than the exclusion zone must be used.

4.5.1. Operating an Excavator Below an Excavated Face.

The maximum height of the excavated face should not exceed the cab height. Where this is not possible (ie, commencing operations after a blast), the following controls as part of a JHA shall apply:

- Access to drop zone must be restricted with a hard barrier to restrict access to persons and mobile plant.
- Excavator to maintain void of at least 1 x bucket width and depth whilst double benching.
- Catch bench to be maintained of at least 1 x bucket width between dig face and floor RL.
- Material to be excavated to 90 degrees to the tracks at full reach ensuring void is maintained.
- Where possible a tracked dozer is to be used to reduce the height of the free face to a height that is equal to or less than the cab height of the excavator.
- Positive Communication to be maintained between the dozer and excavator operator to ensure excavator's attachments are clear of fall zone.
- Where there isn't the option of reducing the face height with the use of a track dozer, the floor RL shall be increased until the face height is equal to or less than the cab height of the excavator.
- The excavator shall be walked off the bench for maintenance and refuelling.
- Ensure that when material is being mined from below (ie, in event of a double bench or product stockpile), access to the work area is restricted with the use of a bund.



At times, personnel are required to enter the exclusion zone to carry out their duties, unprotected by FOP (e.g. OCEs, pump crew, drill and blast personnel, fitters, supervisors, and tech services etc).

For entry into these areas, the following shall apply:

- A documented JHA and/or WRAC to be in place for that particular activity, OCE is to review and sign the applicable JHA.
- Only personnel who have received the additional (to that provided in induction) 'Geotechnical Awareness Training' are authorised to enter these areas.
- Visual inspection of area prior to entry is required to visually assess the quality of the highwall. Visual inspection should consider both structural security of wall (major failure) and risk of wall fretting from the face itself or above. An inspection from above the wall may be necessary.
- Ensure sufficient visibility of the wall above working area.
- For equipment broken down in the area, a JHA and/or WRAC shall be completed prior to repairs or the recovery of the machine.

In addition to the above, the following should also be considered and applied where required:

- Establish safety barriers which may include berms/bunds, signs and flagging tape.
- Mobile equipment without ROPs and FOPs is to stay outside the Drop Zone.
- Increased frequency of inspections by supervisor/OCE in critical areas, e.g. ponding, saturation and cracking.
- The use of spotters who are familiar with the task and the work environment who maintain positive communications with personnel in the area.
- Minimise the time spent under a Drop Zone.
- Where practicable, select the equipment that can operate furthest away from the wall.
- Have roads as far away as practicable from walls.

4.5.2. Effect of Water on Slope Stability

The presence of water can significantly affect the stability of dumps, highwall and low wall slopes depending on the material properties, batter angle and the amount of water and degree of saturation.

- Dig and dump design should have adequate provision to drain water away from active faces. If unavoidable:
 - seek geotechnical advice; and
 - provision shall be made to have designated drainage lines in bunds with additional controls for any active operations below.
- Regular inspections should be conducted, and efforts made to prevent pooling of water above or below batters. Gaps and water diversion bunds shall be installed in highwall and dump bunding to allow adequate drainage and reduce pooling of water.
- All attempts should be made to remove water before dumping or spoiling into water is considered.
- As a general rule, material shall not be dumped/spoiled/dozed/blasted directly into bodies of water/mud greater than one metre deep where that material would form the basis of the next strip's spoil profile/ramp system, unless a geotechnical analysis and risk assessment (WRAC) has been performed to assess the slope stability risk and to introduce necessary controls.
- For localised in-pit mining activities where dumping into ponded water is necessary for re-establishing access, pump installation and general pit maintenance, then a JHA is required. If this material is not to be eventually rehandled out of the pit (and will form basis of the next strip's spoil profile) then refer to clause above.

4.6. Persons on foot at the Crest of an Excavated Face or Spoil Dump

Where pedestrians are required to work on an excavated face or spoil dump the following shall apply:

- at any highwall with a safety bund, remain on the 'non-pit wall' side of the safety bund;
- do not climb or stand within one metre of the top of the non-pit wall side of bund; and
- if required to work within 5m of an edge where there is no safety bund, a risk assessment is required.



The figures below provide an explanation of the application of this rule.

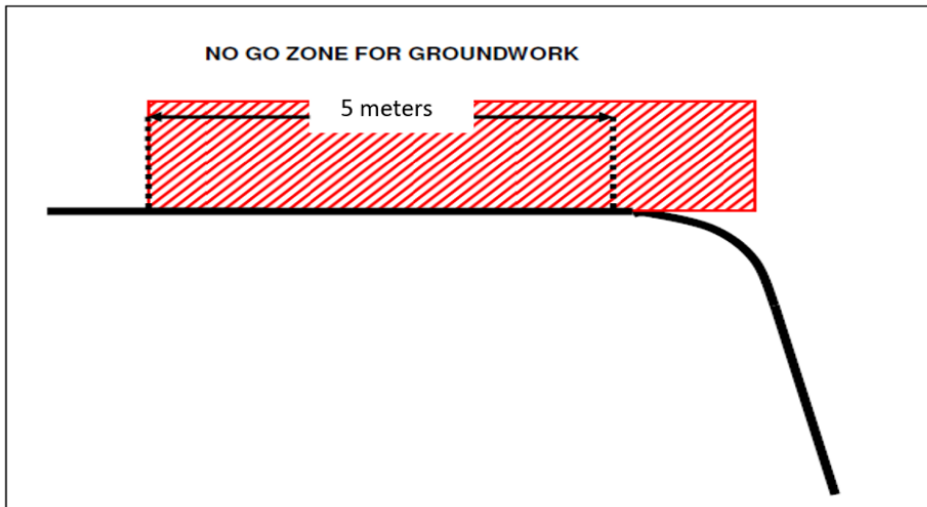


Figure 1 No Go Zone for a highwall without a bund.

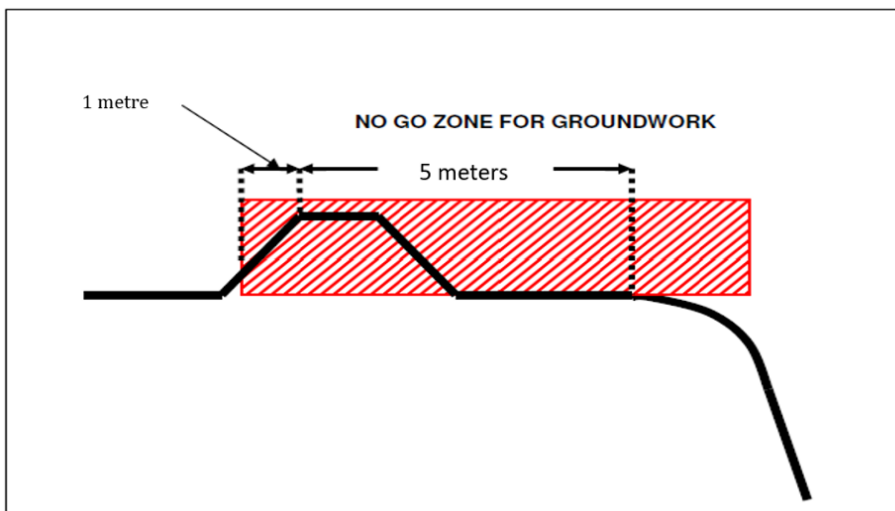


Figure 2 : No Go Zone for a highwall with a bund within 5m

The following measures should be implemented to minimise the risks associated with this activity:

- Establish safety barriers which may include berms/bunds, signs, flagging tape, witches' hats;
- Limit access to the area as required;
- Ground conditions to be monitored by all personnel in the area as well as the supervisor/OCE;
- Maintain good ground conditions by ripping, grading, filling holes and soft spots as required;
- Use of spotters or groundsmen who are familiar with the task and the work environment as required;
- Ensure adequate visibility using lighting plants, equipment lighting and dust suppression measures.



4.5.1 Operating HME at the Crest of an Excavated Face.

- An excavator's work area is restricted and access to this area is gained by the excavator operator's direction. Access onto the bench can be established from two points; the pit floor or sometimes from behind the machine:
- Excavators or Tracked Dozers with their tracks parallel to an excavated face must remain >3m from an exposed edge.
- A ramp onto the tail must be maintained at all times in order to maintain emergency access and avoid the excavator potentially reversing over a vertical face.
- A 1m bund must be established at the toe of the retreat ramp to restrict access to light vehicles.
- the excavator is to walk back a minimum of 5m off dig face to allow walk-around inspections.
- Excavator operator should take all reasonable precautions to ensure the work area is left in a way that does not expose others to an unacceptable level of risk
- - back access roads to excavated faces shall have the same restricted area signage and also be accommodated with an 'open excavated face' sign;
 - these back-access roads may also have a rill/v-drain across the bench with a single gap to minimise entry points to an excavated face (see Figure 5 below);
 - the excavator is to walk back to the rill gap prior to maintenance or refuelling;
 - the excavator is to walk back a minimum of three metres off dig face to allow walk-around inspections;
 - in the event an excavator is left unattended, e.g. crib break, breakdown, etc. any personnel entering these restricted areas shall call the supervisor/OCE as per the VUL-SOP-076-Using Mobile Plant.
- If vehicle access to an excavator is required from the floor, safety rills must be established to delineate the dig face area (see Figure 5 below). If this cannot be achieved, the excavator is to be walked off the bench onto the floor.
- If an excavator leaves a working excavated dig area, an adequate rill bund shall be established on any excavated face or access road leading to an open face before restricted area signage is removed.
- If an excavator breaks down at a dig face, a 1m bund shall be established on any excavated face to allow safe maintenance activities on the bench.
- Where practicable, a safe access to excavators shall be maintained outside any drop zones. In the event the dig set up does not enable a safe and practical access to be maintained a track dozer must be located within the excavator work area.

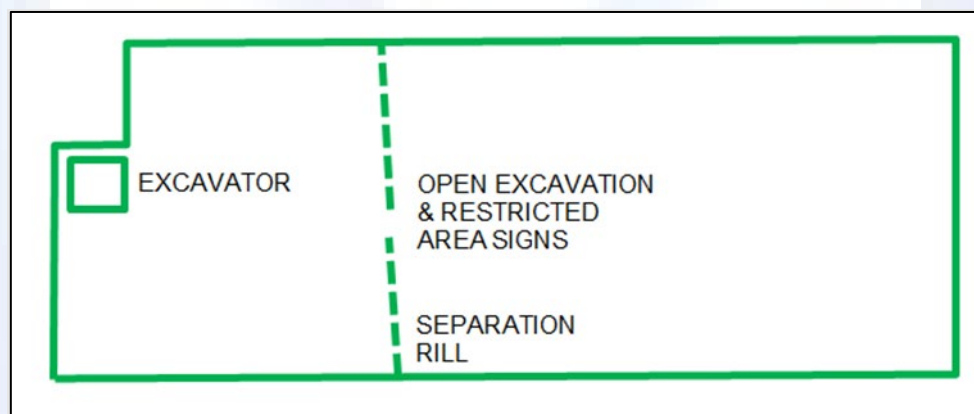


Figure 3 : Accessing a bench from the rear of an excavator.



Figure 4 : Accessing a bench from the front of an excavator.

4.6.1. Access when double benching

- The use of the retreat bench for access should be kept to a minimum.
- A catch trench shall be maintained along the toe of the high face.
- The maximum height of the high face should not exceed the cab height.
- Where the height of the high face exceeds the cab height of the excavator, a JHA shall be completed to assess the risk.
- In the event of breakdown, a risk assessment is to be completed as necessary.
- The excavator should be walked off the bench for maintenance and refuelling.

4.6.2. Conducting Bench Preparation, Drilling and Loading Above an Active Mining Operation

Strip mining methods and scheduling constraints will often dictate that drilling operations will have to be undertaken on the next strip whilst mining is still being completed on the previous strip.

Good drill and blast practice is for the front row of the drill pattern to be approximately one burden parallel to the front excavated face. Highwall crest rollover and the 5m inspection bund often prevent optimum drill pattern design, and these bunds need to be thinned out and pushed inwards in appropriate areas in order to facilitate a good blasting result.

A risk assessment shall be carried out prior to this task being undertaken and controls may include (but not be limited to):

- OCE/TSD feedback on the stability of the wall during the time period of OCE inspections.
- Bund not to be pushed within one metre of the edge to prevent loose material hanging up on the edge.
- Installing protective bunds below the excavated face where mining operations have been completed.
- Excavators digging square on to the wall.
- Use of radar and tell-tales if cracking is detected, where possible.
- Restricted access onto the drill bench.

4.6.3. Cleaning Crest of Highwall with Excavator

When work is being conducted above an excavated face to establish pre-split line, a bund may not be present.

Signage shall be in place for an open excavated face and restricted area. Bunds shall be re-established as soon as possible.

When working below an excavated face, refer to 4.5.



4.7. Sumps

The excavation of sumps poses a serious hazard to both equipment and personnel. The following standard of delineation for sumps shall be followed so no equipment or personnel are exposed to this hazard:

- Bund is to be a minimum of 1m high in such a way as to restrict access and 1m from the edge of any sump established.
- If heavy vehicles are hauling past a sump, the safety berm shall be constructed so as to prevent the heaviest vehicle using that road from passing through the bund and not less than one metre from the edge of the sump.
- Flagging tape between bollards or guideposts shall be used if necessary.
- Sumps are not to be excavated where adequate bunding cannot be established.

Prior to any personnel entering a sump to perform a task, consideration shall be given through adequate risk assessment, e.g. a JHA considering at least:

- The potential for changes in atmosphere.
- Shoring and/or battering to prevent collapse of the sides of a sump.
- Suitable access and egress for personnel working in the sump.
- If the risk of a person becoming submerged in a body of water is present, the person must be fitted with a personal floatation device.
- Requirements of VUL-MOP-093-Working near water

Refer to the VUL-SOP-096a-Confined Space for guidance on how to identify and manage working in a confined space.

4.8. Risk Assessment

Where any of these parameters cannot be met and the risk remains unacceptable, a risk assessment is required to ensure adequate controls are put in place to reduce the risk to As Low As Reasonably Practicable. When conducting a risk assessment, careful consideration should be given to the following:

- Interaction with other equipment and personnel in area.
- Visibility.
- Ground surface and conditions (stability, material type, slumping, cracking) – may include geotechnical advice.
- Limitations on work area (width of haul road or bench, etc.).
- Inclement weather.
- Type of terrain
- Presence of water and drainage.
- Size and presence of safety berms / bund.
- Use of signage and other safety barriers.
- Frequency of inspections.
- Limiting access.
- Communication of hazards and activity to other personnel who may be affected.
- The use of technology for monitoring purposes, e.g. radar to monitor spoil or ground movement.
- Physical inspection of the area by the team completing the risk assessment.

4.8.1. Key Hazards

Discharge of Loads has been identified as having the potential to cause multiple fatalities due to the associated vehicle interaction and geotechnical hazards. Some of the key hazards associated with discharging of loads includes:

- Vehicle interaction.
- Loss of control of equipment.
- Ineffective positive contact.
- Uncontrolled movement.
- Equipment Failure.
- Contact with electrical infrastructure.
- Dumping over edges.
- Overloading material.
- Engulfment.



4.8.2. Controls

- Trained, competent and authorised operators.
- Establish positive contact with operating heavy equipment before approaching.
- Park equipment securely so that it cannot move in an uncontrolled way (fundamentally stable).
- Adequate lighting must be provided to illuminate dumping areas and immediate approaches to dumping areas.
- All vehicles not directly involved in the activity must maintain a distance of 50 metres from operating heavy vehicles or mobile equipment. If required to enter within 50 metres, positive two-way radio contact must be established prior to entry.
- During loading and dumping operations, inspection of the excavated face and dump edge and toe is to be completed as part of the OCE and supervisor inspection.
- Assess ground conditions and obtain a geotechnical assessment if required.
- An exclusion zone of 25 metres from power lines or sub-stations must be maintained for mobile equipment operations with ground engaging tools or extendible devices.
- VUL-PHM-002-Vehicle Interaction PHMP and VUL-PHM-003-Geotechnical PHMP.

5. 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.
Dozer Operators	Be the primary controller of the dump. Ensure regular physical inspections are conducted of unstable dumps and stockpiles.



6. REFERENCES

- AS 5062:2022 Fire protection for mobile and transportable equipment
- AS 60529-2004 (R2018) Degrees of protection provided by enclosures (IP Code)
- AS/NZS 4024-2019 Series Safety of Machinery
- AS/NZS 60079.10.1 Explosive atmospheres - Classification of areas - Explosive gas atmospheres
- AS/NZS 60079.10.2 Explosive atmospheres - Classification of areas - Explosive dust atmospheres
- Coal Mining Safety and Health Act 1999 (Qld)
- Coal Mining Safety and Health Regulation 2017 (Qld)
- Safety Alert 77 Dumping over tip heads
- Safety Alert 97 Restricting access to hazardous areas
- Safety Alert 247 Trucks tipping over the edge
- Safety Bulletin 35 Excavation edge protection
- Significant Incident 17 Dump truck with unbalanced load becomes unstable
- Significant incident 26 Dumping overburden near coal crew operations
- Significant Incident 40 Truck falls backwards over tipping edge
- Significant Incident 42 Rollover of rear dump truck
- Significant Incident 46 Haul truck reverses over quarry bench
- VUL-PHM-002-Vehicle Interaction PHMP
- VUL-PHM-003-Geotechnical PHMP
- VUL-SOP-076-Using Mobile Plant
- VUL-SOP-096a-Confined Spaces
- VUL-SOP-128-Design and Construction of Mine Roads
- VUL-SOP-133-Dishcharging Loads from Fixed and Mobile Plant
- VUL-SOP-138(a)(b)-Work on or near Product Stockpiles and Coal Waste Dumps

7. REVIEW

This document shall be reviewed at a minimum every two years, 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.

8. DOCUMENT CONTROL

Version	Date	Description	Document Controller
01	03/06/2020	Initial draft	Rachael Dacker
02	07/07/2020	Risk Workshop	Shane Johnson
03	29/04/2021	Review & Formatting	Nicole Davey
04	20/10/2022	Cross Section Review and Update	Andrew Baillie
05	10/07/2023	Review and Update	Allira Spencer