BATHURST
RESOURCES LIMITED

Stockton Mine
Ground and Strata Instability Principal Hazard Management Plan

STO-TEC-PHMP-002 V4.0

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1.0 Introduction

This Ground and Strata Instability Principal Hazard Management Plan (GSI-PHMP) has been developed to document the arrangements for the management of Ground and Strata Instability at Stockton Mine to ensure the risk to the health and safety of workers is eliminated where practicable, and where it is not practical to eliminate, minimised so far as is reasonably practicable.

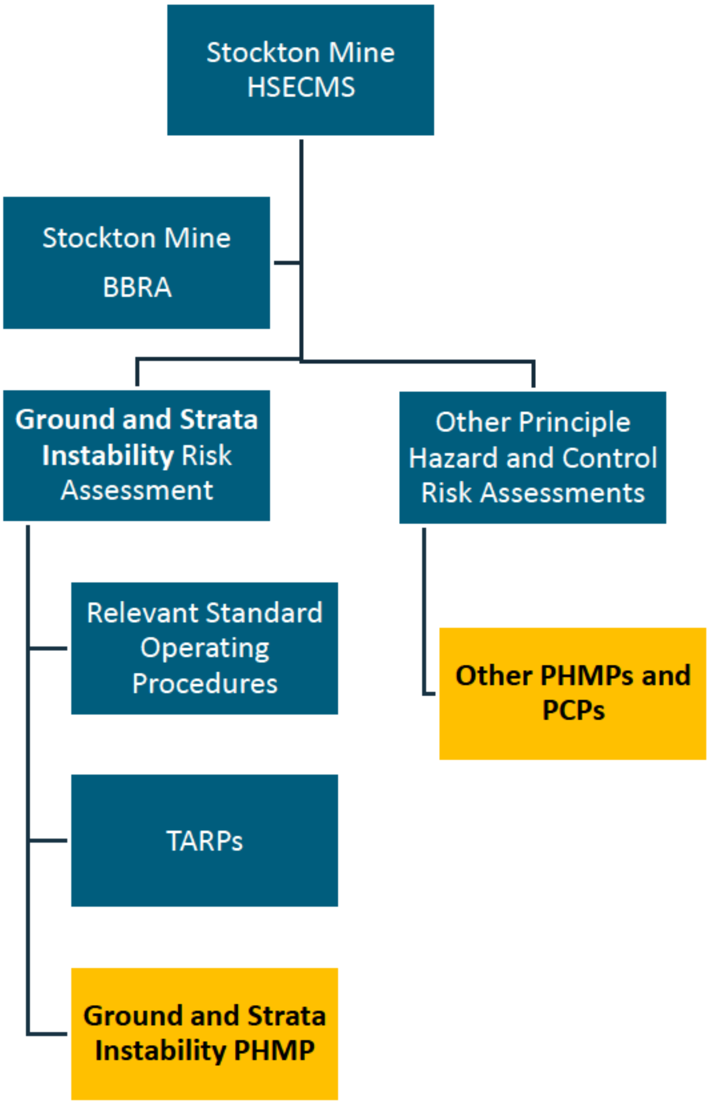

Figure 1: GSI-PHMP position within the Stockton mine HSECMS

This PHMP interacts with the following Stockton Mine PHMPs and PCPs which should be read in conjunction with this document:

- ***STO-MIN-PHMP-001 Roads and Other Vehicles Operating Areas PHMP;***
- ***STO-TEC-PHMP-003 Tips Ponds and Voids PHMP; and***
- ***STO-HST-PCP-002 Emergency Management PCP.***

2.0 Scope

This PHMP is authorised by the Site Senior Executive (SSE) and is applicable to all BRL employees and contractors working within development, construction, operations, decommissioning and closure phases at Stockton mine. It forms part of the Health, Safety, Environment and Community

Management System (HSECMS) which meets the requirements of the New Zealand Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016 (HSW (MOQO) Regs) - *Part 3 Health and Safety Management System*.

It details the roles and responsibilities of all Stockton mine workers in relation to Ground and Strata Instability at the mine under the responsibility of the SSE.

3.0 Objective

This PHMP meets the requirements of the Health and Safety at Work Act 2015 (HSW Act) and the HSW (MOQO) Regs, **Attachment 1**.

4.0 References

- *Health and Safety at Work Act 2015;*
- *Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016;*
- ***STO–HST-BBRA-001 Broad Brush Risk Assessment;***
- ***STO-MIN-PHMP-001 Traffic and Roads PHMP;***
- ***STO-TEC-PHMP-002.01 Ground Control and Strata Risk Assessment;***
- ***STO-TEC-PHMP-002-02 Ground and Strata Generic TARP***
- ***STO-TEC-PHMP-002.03 Dump Stability Generic TARP***
- ***STO-TEC-PHMP-002.04 Cypress Highwall Exclusion Zones TARP***
- ***STO-TEC-PHMP-002.08 Geotech Awareness Training;***
- ***STO–TEC–PHMP-003 Tips, Dams and Voids PHMP;***
- ***STO-TEC-PHMP-004 Inundation and Inrush PHMP;***
- ***STO-TEC-PHMP-005 Explosives Management PHMP,***
- ***STO-TEC-PLN-020 Geotechnical Management Plan;***
- ***STO-HST-PCP-002 Emergency Management PCP;***
- ***STO-TEC-SOP-005 Drilling Around Void Hazards;***
- ***STO-TEC-SOP-013 Mining Around Void Hazard Areas;***
- ***STO-MIN-SOP-024 Pit Inspections;***
- ***STO-MIN-SOP-054 Operation of Excavator;***
- ***STO-MIN-SOP-055 Operation of Dump Truck;***
- ***STO-MIN-SOP-056 Operation of Dozer;***
- ***STO-ENV-SOP-065 Water Management Infrastructure and Pond Inspections;***

- ***STO-MIN-SOP-069 Dumps, Stockpiles and Hoppers;***
- ***STO-TEC-TEM-004 Stockton Mine Geotechnical Assessment Short Memo***
- ***STO-TEC-FRM-087 Stockton Mine Dig/Dump Plan Mine Planning Checklist – Sign Off***
- ***STO-TEC-DGL-001 Design Conformance Guideline***
- ***BRL-HST-STD-001 Risk Management Standard;***
- ***BRL-HST-STD-001.12 Ground and Strata Instability CCV;***
- ***BRL–HST–STD–003 Document Control Standard;***
- ***BRL-HST-STD-004 Training Standard;***
- ***BRL-HST-STD-006 Workplace Inspections Standard;***
- ***BRL-HST-STD-007 Non-Conformance and Corrective Action Standard;***
- ***BRL-HST-STD-008 Audit Standard;***
- ***BRL-HST-STD-019 Worker Engagement Standard;***
- *Cypress Mining Project PAG L5 Geotechnical Design of Highwalls and Overburden Stockpiles Golders 2010; 0*
- *Geotechnical Assessment of the No2 South Highwall Design Stockton, Brian Adams and Tom Lucas 2011 reviewed by PSM Engineering consultants; and*
- *Project 1234 Millerton Mine PAG Level 5 study, Brian Adams 2010 and reviewed by Tonkin & Taylor.*
- *Technical Report - Resource Estimate Report for the Stockton Deposit June 2016, Fick P; and*
- *Health and Safety at Opencast Mines, Alluvial Mines and Quarries, Good Practice Guidelines.*
- *Cypress Highwall Failure Geotechnical Review – Golder 2019 Reference No. 19122456-002-LR-Rev0; and*
- *Cypress Highwall Stage 2 Proposed Eastern Highwall Dewatering – Golder 2020 Reference No. 19122456_7407-003-LR-Rev0*

5.0 Risk Assessment

A risk assessment has been completed to support the development of this PHMP using a semiqualitative methodology as outlined in the ***BRL-HST-STD-001 Risk Management Standard***, to apply a facilitated team-based approach to risk identification, risk analysis and risk evaluation. This risk assessment technique assessed the level of risk in accordance with defined consequence and likelihood factors to determine and ensure risks to health and safety of workers are eliminated and where not practicable to eliminate, minimised so far as reasonably practicable. The risk assessment provides an understanding of the potential risks associated with tips, ponds and voids and determines the primary controls that alone, or in conjunction with other controls, significantly reduces the likelihood and/or impact to an acceptable level.

As a result of the risk assessment, a range of controls (taking into account the hierarchy of controls) have been identified to manage the risks associated with Ground and Strata Instability at Stockton Mine.

Considered in the development of this PHMP were:

- Structural geology
- Geotechnical characterisation of Stockton materials
- Defect orientation
- Weathering of bench materials over time
- Geotechnical analysis and design of highwalls and low walls
- Design processes and approvals
- Historic underground workings and voids
- Seismic event analysis
- Surface and groundwater regimes and potential changes to these regimes
- Extreme weather events
- Dump floor geometry and conditions
- Personnel competencies and training
- Encapsulated material geotechnical characteristics
- Blasting practices and impact on highwall integrity over time
- Fall of ground in Mangatini Sump drainage Adit
- Emergency response

The effectiveness of the controls will be monitored by:

- Workplace inspections by a competent person prior to and during shifts;
- Operator checks and inspections of their work environment prior to and during the shift;
- Safe Work observations and compliance inspections by leaders including verification of critical controls; and
- HSEC Audits of the workplace against this GSI-PHMP.

5.1 Assumptions

A number of assumptions have been considered in the development of this PHMP including:

- Risk Management tools (Take 5 and JSEAs) have been completed as required as the minimum risk management measures;
- Workers are trained, assessed as competent and authorised as per the ***BRL-HST-STD-004 Training Standard***;
- Minimum site entry requirements have been met (BRL and site Inductions, Workplace Familiarisations and Mandatory Standard Operating Procedures (SOPs) have been completed;
- Workers are wearing appropriate minimum Personal Protective Equipment (PPE) when executing work;

- Workers present Fit for Work; and
- Workers have access to and are using fit for purpose equipment.

In establishing the scope of the PHMP, consideration was given to the physical boundary of the mine and areas adjacent to the mine which could be impacted by operations at the mine.

5.2 Identified Unwanted Events

The primary unwanted events associated with ground or strata instability hazards at Stockton Mine include:

- Highwall or low wall failure;
- Bench Failure; and
- Fall of ground – (Mangatini Sump Adit).

The management of the following unwanted events are covered in ***STO-TEC-PHMP-003 Tips, Ponds, and Voids:***

- Tip/dump failure;
- Dam/pond/sump failure; and/ or
- Historical underground workings.

Rocks falling from equipment (conveyors, trucks etc) are excluded as they are not considered ground or strata instability issues.

5.3 Critical Controls and Verification

Management of the risks associated with ground and strata instability at Stockton mine is achieved through the identification, implementation and monitoring of Critical Controls which have been identified from the risk assessment.

To ensure that the Critical Controls are in place and are effective, a Critical Control Verification (CCV) process has been developed to monitor the effectiveness of the Critical Control, and to implement appropriate corrective and preventative actions if required

CCVs will be actioned in INX conducted on a monthly, quarterly, or annual basis. Once completed, the CCV will be upload to INX as evidence that the CCV has been completed.

6.0 Mine Overview

Stockton Mine is a large-scale open cast coal mining operation which mines approximately 1.1 Mtpa of export coking and thermal coal and moves up to 4.5 Mbcm of overburden (including interburden) per year using conventional truck and excavator extraction methods supported by a range of ancillary/support equipment. The mine is located approximately 35 km north-east of the town of Westport and 8 km west of Granity.

[redacted]

[redacted]

Stockton mine is located on the Stockton Plateau, primarily within Coal Mining Licence (CML) 37150 and Mining Permits (MPs) 41810 and 52937, however, a number of ancillary MPs are held to allow full extraction of coal within the CML.

6.1 Climate

Stockton Mine has an average annual rainfall of 6,500 mm per annum. Prevailing westerly and north westerly moist oceanic airstreams ascend the western escarpment with consequent cooling, condensation and increase in wind speed. Low cloud and fog are common, and snow occurs occasionally, usually once or twice a year.

7.0 7.0 Geological Characteristics

At Stockton Mine, in-situ ground conditions have been identified through exploration drilling and geological logging, geological mapping aerial work, reviews of the Historical Underground Workings and experience from historical mining records in the area.

The Stockton Plateau is an elevated and dissected dip slope that dips to the north-east, cut by streams, locally deeply incised, and by fault scarps and minor folding. The highest elevation is 1100m (Mt Frederick), located at the southern end of the CML. The surface topography reflects the underlying Brunner Coal Measures which have formed a resistance erosion surface.

Coal deposits on the Stockton Plateau are located within the Eocene aged Brunner Coal Measures (Mangatini Coal Seams) which unconformably overly metamorphosed greywacke and argillite of the Palaeozoic Greenland Group, intruded in the Cretaceous by high-level granitoid plutons. The coal deposit has been offset by a number of regional scale and small-scale faults which locally impacts on mining activities. Coal seams range in thickness from 0.5m to 20 m but average 8m thick. The bulk of the deposit is classified as high volatile bituminous A-B coal containing very high amounts of vitrinite. (Resource Estimate Report for the Stockton Deposit, Fick P, 2016)

7.1 Faulting and Structures

The Buller Coalfield (including Stockton) is bounded by two north-northeast trending reverse faults. The Mt William Fault in the east and the Kongahu Fault, which is part of the Paparoa Tectonic Zone, in the west. Approaching the Kongahu Fault, dips steepen and trend increasingly to the north-west and structural complexity increases.

The Kongahu Fault is characterised as a zone of major thrust faulting trending SW-NE along the base of the Stockton Plateau escarpment. The exact throw on the fault is not known but is considerable.

The SE-NW trending Mt William Fault is also identified as a low to moderate angle thrust fault with decreasing throw to the north-east.

The Kongahu and Mt William Faults in their present form are the result of post-Oligocene compression. They are considered to be reactivated normal faults originally active before and during BCM sedimentation.

[redacted]

There is considerable faulting of the Stockton coal deposit on both a small and large scale. Seven large scale faults (fault throws >10m) have been mapped with hundreds of small-scale faults (0-10m throw) mapping in outcrop and often observed on coal floors where the faults are easily identified.

[redacted]

7.1.1 Mt Fred Fault

The Mt Fred Fault forms the westernmost boundary to the No2 South, A-Drive mining areas. The fault was also responsible for elevating the mined-out Mt Fred mining area.

7.1.2 Augustus Fault

The Augustus Fault is a steeply dipping (to the west) reverse fault with on average 12m of offset (down through on the western side of the fault) however the throw decreases 6m at the northern end of the fault.

7.1.3 Mangatini Fault

The Mangatini Fault is an east-west structure that forms the boundary between the Millerton Block to the north and the 4-West and Mangatini Blocks to the South. The fault is truncated by the Settlement Fault in the west. The Fault plane generally dips steeply to the south but in places dips steeply to the north. The movement is predominantly reverse along the fault but changes to normal where the fault plane rolls over. Offsets have been measured up to 30m however the true off-set maybe greater than this as coal ramps up towards the fault. The offset on the fault reduces to 10m towards the western end where a number of smaller splays develop.

7.1.4 Jorgensen Fault

The Jorgensen Fault forms the western side of the Millerton mine area and strikes NE-SW. The fault has been mapped as westerly dipping structure along which the BCM have been down thrown to the northwest by up to 70m in places, with the throw increasing from the SW to the NE. There is evidence that movement of the fault was syndepositional with the thickest coal being located on the down thrown side of the fault. Coal has also been observed on-lapping to the fault plane in places.

7.1.5 Folding

There are no significant regional structural folds, within the Stockton Mine area. All structural deformation is directly related to significant faulting, with the coal seams deformed the most.

7.2 Mining Areas

The Stockton deposit has been divided into a number of mine areas based upon historical naming convention. These mine areas have their own geological characteristics:

Mt Fred is the southernmost mine area within the CML, coal mining was completed in 2014. All in-situ coal has been mined out.

No2 South mine area contains the active mine areas of SN13 and SN14. The mine area is bounded by the Mt Fred Fault in west.

A-Drive Block is characterised by having numerous seam splits with the addition of highly carbonaceous material overlying the coal seams.

Augustus mine area is characterised by the Augustus Fault which forms the western limit of the coal within this block. The A13 coal block is also off set by other smaller scale faults.

Webb and Mangatini Blocks are characterised by having a number of coal seams (seam splits) with the lowermost seam (M211) being the thickest seam. Some of the coal within these mine areas has been underground mined historically.

McCabes mine area is the most easterly mine block within the CML. The mine area is characterised by a predominantly single seam 2-4m in thickness. Portions of the coal have been underground mined historically.

Rockies mine block is subdivided into Rockies West and Rockies North. The Rockies mine block is characterised by having a high frequency of small-scale faults and also a large number of regional scale faults, of which the Jorgenson Fault forms the eastern boundary.

Millerton mine blocks are characterised by primarily having a single thick seam (average 8m). These areas have been underground mined historically and there are current and historical underground coal fires.

Cypress mine block is characterised by moderately dipping floor towards the east into the Mt William range. The coal is truncated by the east dipping Mt William reverse fault. A number of small faults offset the coal and are both perpendicular and oblique to the Mt William Fault.

7.3 Geotechnical Assessment

For large scale cuts or plans an overarching geotechnical assessment report is generated with 3rd party input or review. Geotechnical assessment reports conducted for large scale plans include:

- *Cypress Mining Project PAG L5 Geotechnical Design of Highwalls and Overburden Stockpiles Golders 2010;*
- *Cypress Opencast Mine Review of Geotechnical Feasibility Study Pells Sullivan Meynink 2010:*
- *Geotechnical Assessment of the No2 South Highwall Design Stockton, Brian Adams and Tom Lucas 2011 reviewed by PSM Engineering consultants;*
- *Project 1234 Millerton Mine PAG Level 5 study, Brian Adams 2010 and reviewed by Tonkin & Taylor.*
- *Cypress Highwall Failure Geotechnical Review – Golder 2019 Reference No. 19122456-002-LR-Rev0; and*
- *Cypress Highwall Stage 2 Proposed Eastern Highwall Dewatering – Golder 2020 Reference No. 19122456_7407-003-LR-Rev0*

For small scale plans or minor changes to a large plan, a geotechnical review by the Technical Services department is conducted documented on ***STO-TEC-TEM-004 Stockton Mine Geotechnical Assessment Short Memo*** to ensure the stability of the design is maintained. The memo is provided to the Mine Engineer for inclusion with the dig or dump plan.

Small scale reviews and assessments are stored on the Technical drive (T: drive).

7.4 Seismic Hazard Assessment

A seismic hazard assessment is completed, where required, for large scale or permanent structures (e.g., permanent high walls/dams) during the design and assessment phase.

7.5 Historic Underground Workings

Historical Underground Workings (HUWs), located in the Millerton work area have been identified as a geotechnical hazard with the potential to impact on ground stability. Controls to manage the risk to workers at the mine is incorporated into the mine design and throughout the mining process.

7.5.1 Collapse Blasting of Historical Underground Workings

Prior to mining in areas of HUWs, collapse blasting is conducted to eliminate the risk of mobile equipment or pedestrians falling into voids.

Where collapse blasting will not be effective (e.g., due to the depth of the coal seam or presence of an interburden layer), other mining methods are implemented such as:

- Exclusion zones;
- Dig and prove; and
- Double benching.

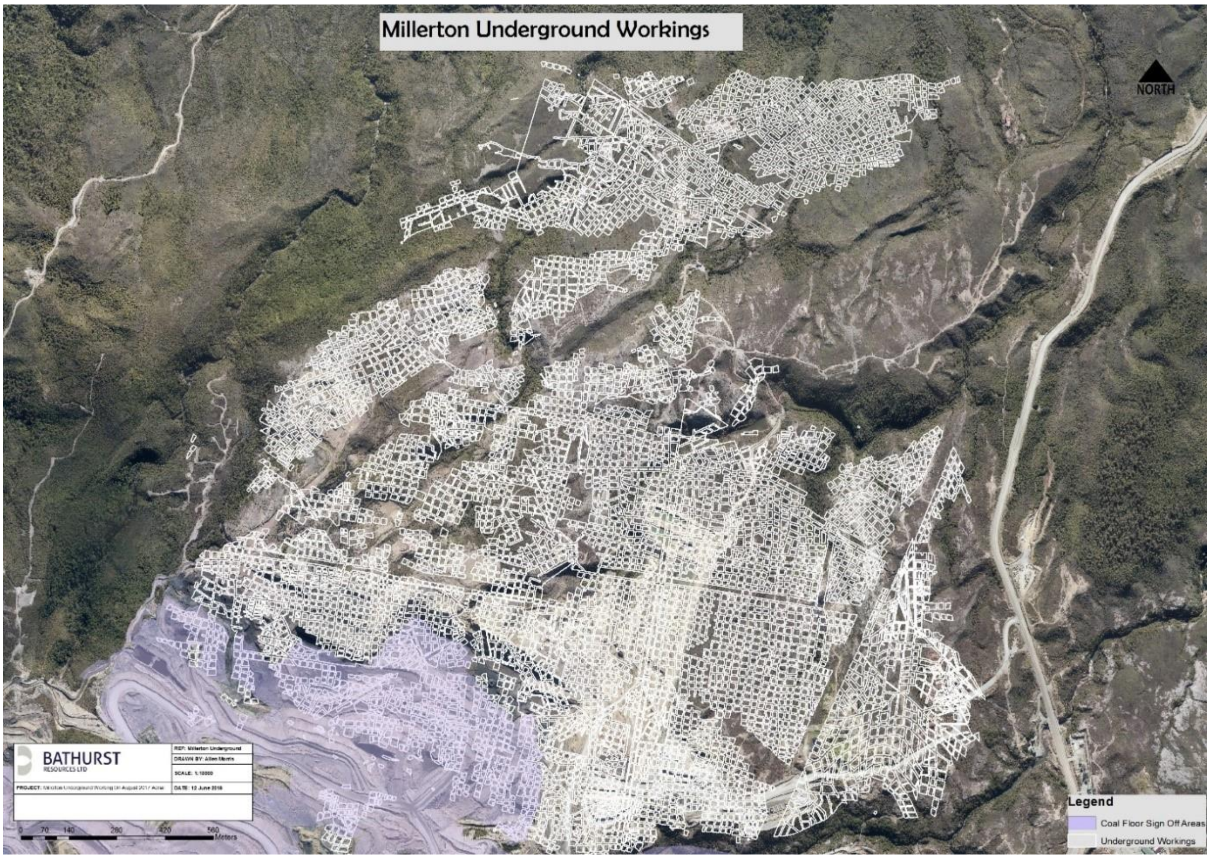

Figure 6 Millerton Pit overlaid with Historical Underground Workings

7.6 Hydrogeology

Information or data collected from field investigations throughout the mine life and pertinent to the hydrogeology of the mine are stored, analysed, interpreted, and referenced in any updated hydrogeological model. Information collected should include:

- Compilations of all available groundwater measurements across the mine;
- Records of regular monitoring of groundwater levels; and
- Monitoring of springs and ground water seeps from high walls. This information will be used in conjunction with piezometers to construct phreatic ground water surfaces. Ground water surfaces are critical for slope stability analysis.

7.7 Mining Activities Carried Out

The operation is a conventional truck/excavator operation supported by a range of ancillary/support equipment. Access into the pit is via a series of ramps. Open pit slopes are designed as a series of batters separated by working benches, ramps, and catch benches, which are provided at predefined vertical height intervals of the slope. The principal functions of benches are to catch and retain any material falling from the batter faces and crest and to improve ove8all slope stability. Interim slopes are made up of working faces (cut faces) separated by benches to achieve the required interim slope angles.

The working faces are formed by an excavator removing overburden or coal in layers. The final cut slope design represents the final cut slope to be left at the end of excavation of the pit or a stage of the pit. The overall slope between ramps and/or working benches comprises the batters, working faces, and benches between the ramps/working benches and is measured from the toe of the slope to the topmost crest. The batter face angles are defined between the toe and crest of each bench, whereas the inter-ramp slope angles between the haul roads/ramps are defined by the line of the bench toes. Figure 7 illustrates the terminology used.

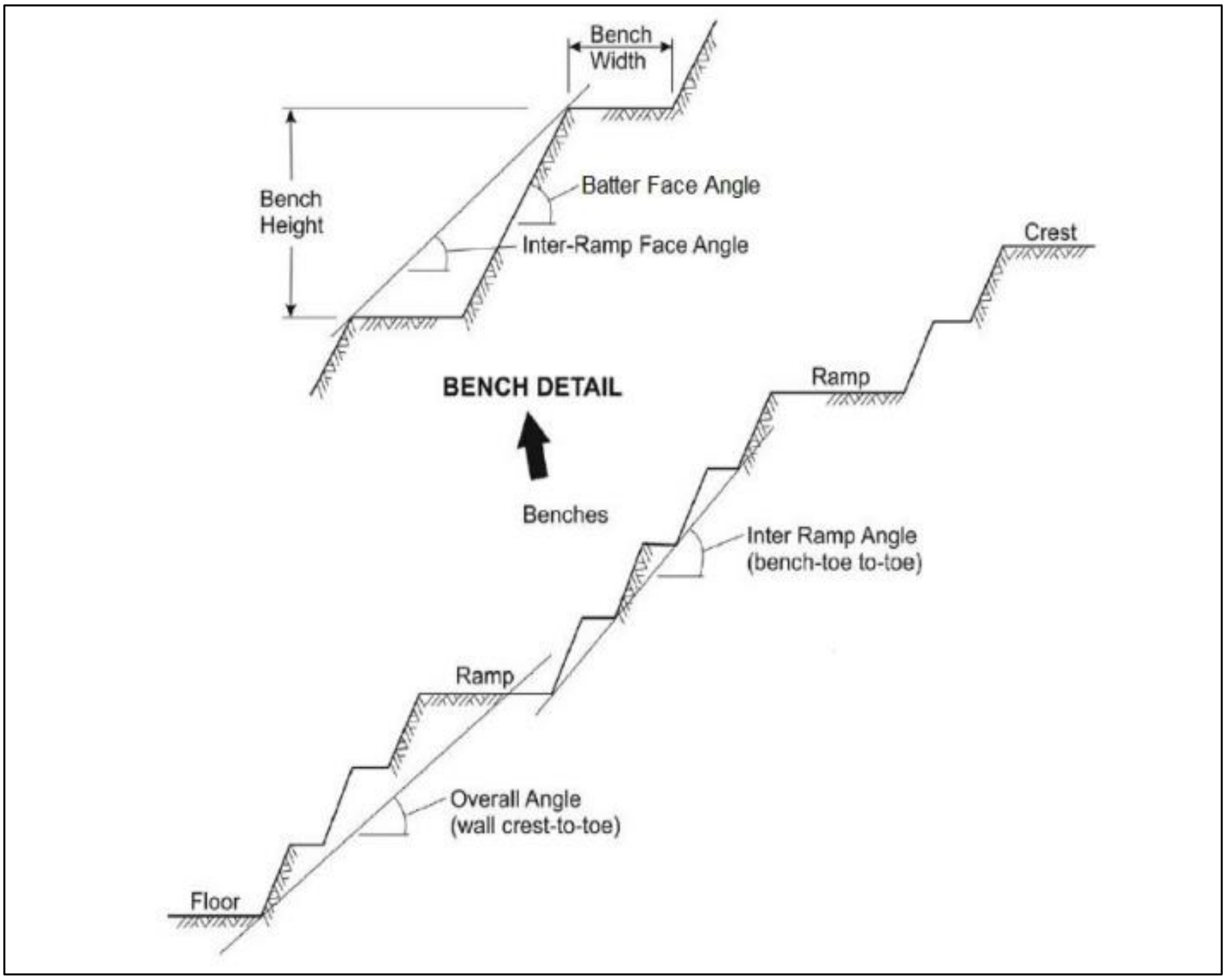

Figure 7 Examples of Open Pit Terminologies

8.0 Control Measures

The hierarchy of controls will used at all times to ensure the most effective controls are implemented and integrated from the design stage. Observations and results from past experience are applied to future mine planning.

8.1 Planning and Design

Mine planning and design must be undertaken by suitably experienced and competent persons (refer to Section 13 Table 2 and Section 15 Table 3). The planning and scheduling process must take into account the appropriate scheduling of material types to ensure interim and final slopes are able to be constructed with geotechnically stable final and interim slopes in accordance with slope and backfill design parameters. The Technical Services Manager is to ensure adequate resources are available. Technical and Operational staff are to ensure the following controls where required are implemented.

The mine engineer designing the dig or dump plan must complete the ***STO-TEC-FRM-087 Stockton Mine Dig/Dump Plan Mine Planning Checklist – Sign Off*** form and ensure it is reviewed and signed off by the Technical Services Manager, and the Mine Manager or Operations Superintendent.

8.1.1 Design Documentation

The input data, assumptions, parameters, analysis, modelling, and design methodology, underpinning final designs must be compiled, documented and auditable.

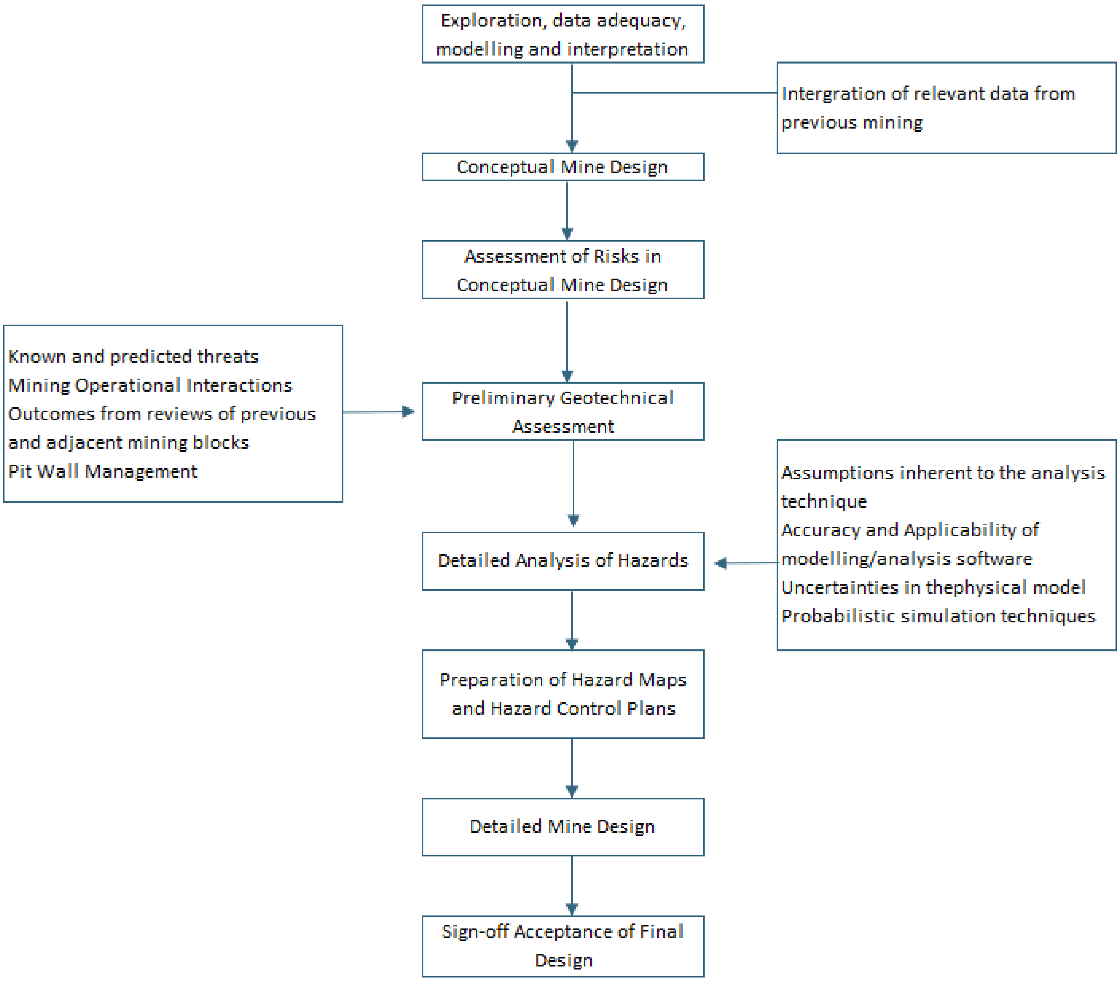

Figure 8 Geotechnical Design Process (some aspects of this may not be required)

8.1.2 Geotechnical Design Guidelines

Stockton Mine has developed site specific Geotechnical Design Guidelines (***STO-TEC-PLN-020 Stockton Mine Geotechnical Management Plan***) which specify the geotechnical design processes and mandatory controls to be implemented for safe, effective, efficient, and sustainable management of geotechnical risk at the mine. The guidelines include:

- Permanent cut slopes (typically forming mining pit walls, quarries, sumps, drains, infrastructure platforms, haul roads, ramps, etc);
- Temporary cut slopes (typically forming interim pit or quarry walls, temporary coal faces, etc)
- Cuts and fills for temporary road, drain or access track construction
- Overburden waste rock dumps
- End of mine life (EOML) engineered final landforms (ELF's)
- Operations over abandoned underground mine workings and associated hazards including but not limited to Voids, Fires & Gas
- Water retention embankments (dams) and excavations (sumps)

8.1.3 Planning and Design Controls

Design of final and temporary high walls is undertaken by the Mining Engineer and is based on the geotechnical model, geological model and ongoing assessment of the geological performance and hazards of the mining area. The following key issues are included in the design parameters during mine plan development:

Mine planning controls to address these issues include:

- A review of each proposed mining area/strip including consideration of;
  - Known and predicted threats – geological, e.g., Structures, variations in material strengths and non-geological, e.g., Placement of ramps, dumps, and underground workings;
  - Mining and operational interactions;
  - Ground monitoring methodologies, locations, and frequencies e.g., Slope stability monitoring, GeoMos and/or Radar;
  - Pit wall management methodologies and appropriate working methods i.e., highwall mapping;
  - Preparation of Geotechnical Hazard Plans where required;
  - Detailed mine design where the design is adjusted to suit the actual geological, hydrological setting, mining, and operational context;
  - Assessment of the risks in the detailed design;

- Geotechnical High wall design parameters are developed for each high wall, modelled under different conditions (i.e., saturated/non saturated). All long-term high wall designs are externally peer reviewed;
- Drilling, logging, and sampling of specifically design drill holes to assist in the determination of high wall design parameters;
- Geological and Geotechnical mapping of high walls and data acquisition and interpretation;
- Pits are designed to maximise water drainage from pit;
- Seismic event loading is considered in developing the design for all long term highwalls, which is consistent with mining consent conditions;
- Redesign highwall if deviation from design impacts on integrity of the highwall;
- Benches designed in coal are avoided where possible;
- The historical underground voids are considered during the development of the highwall design criteria. Millerton underground investigations completed over a number of years which has provided an understanding of the historical underground workings. Any Historical underground workings located are updated on the plans;
- Where highwalls have historical underground workings within them, the historical workings are considered in the design;
- Drill and Blast designs recommendations included in the design for highwalls e.g., pre-split blasting;
- Resource development and grade control drilling undertaken to raise confidence in geological/structural models used in design criteria development;
- Geotechnical Analysis undertaken Prior to mining using exploration information, ongoing monitoring, and site experience;
- Planning of the sequence of overburden removal to ensure that global stability of the overall highwall is preserved using such methods as excavating overburden from the top to relieve highwall and pit wall toe stresses;
- Catch benches included in design; and
- Dedicated Geotech resource available.
- Access for monitoring requirements
- The mine engineer publishing the dig or dump plan will complete the following form - ***STO-TEC-FRM-087 Stockton Mine Dig/Dump Plan Mine Planning Checklist – Sign Off***

8.2 8.2 Slope Performance Monitoring

Any significant slope instability within the pit slopes or backfill materials will be analysed, and the geotechnical model updated. This information will be used as the basis for design review of the mining operation. Moving slopes can be monitored by a variety of techniques such as but not limited to survey monitoring pins, extensometers, inclinometers, total stations, and slope radar etc. Slope movement is to be monitored relative to time so rates of movement (Velocity and acceleration) can be assessed, and the risk status of the slope can be determined.

8.3 Contingency Options

Contingency options are identified during the planning and design process to deal with poor slope performance such as Footwall or Hanging Wall slumping. One or a combination of the following options is generally available:

- Slope unloading – removal of material at the top of the slope to reduce the driving forces of a failure;
- Slope re-profiling – shallowing off of a slope to improve the factor of safety;
- Backfill buttressing – material placed against the cut slope;
- Surface water control – direction of water away from the slope or work area;
- Changes to the mining direction or mining methodology (down dip versus up dip); and if required
- Groundwater depressurisation using angled drain holes.

8.4 Operational Controls

All mine workers must report unsafe bench and batter conditions (i.e., out the design requirements final or interim) to their Supervisor before entering the area where the hazard exists. The Supervisor will ensure controls are in place to appropriately manage the risk to personnel and equipment. The Operations Supervisor/Superintendent will ensure adequate working room is provided for the type of equipment and mining method. If this cannot be achieved a risk assessment must be completed and approved. When mobile equipment is working faces or near the toe of faces it should be worked perpendicular to the working face.

8.4.1 Exclusion Zones

Exclusion zones may be revised depending on conditions and assessment

Exclusion zone procedures include, but are not limited to:

- Pedestrians
    - Voids Procedures
    - Relevant TARPs (see TARP section)

- Within 3 metres of a highwall crest unless protected by a safety berm;
- Unprotected tip heads, dump edges or dams;
- Within 50 m of operating mobile equipment which is not part of a circuit, without prior positive communications (particularly within dig areas, dump areas, go-lines, parking areas and workshop/office areas) See 50/20 Rule;
- Workers must not be positioned between the slope and any part of any mobile plant or equipment that would hinder their escape from falls or slides.

- Equipment
  - ***STO-MIN-SOP-054 Operation of Excavator***
  - ***STO-TEC-SOP-027 Drilling In & Around Void Hazards;***
  - ***STO-TEC-SOP-013 Mining Around Void Hazard Areas***
  - Trigger Action Response Plans (TARPs)
    - ***STO-TEC-PHMP-002.02 Ground and Strata Generic***
    - ***STO-TEC-PHMP-002.03 Dump Stability Generic***
    - ***STO-TEC-PHMP-002.04 Cypress Exclusion Zones***
  - Within 3 metres of a highwall crest unless protected by a safety berm;
  - Within 10 metres of a highwall toe (unless Roll over Protection (ROPs) and Fall on
  - Protection (FOPs) is installed on the Mobile Equipment);
  - Unprotected tip heads, dump edges or dams (unless included in the procedure);
  - Within 50 m of operating mobile equipment which is not part of a circuit, without prior positive communications (particularly within dig areas, dump areas, go-lines, parking areas and workshop/office areas) See 50/20 Rule;

No pedestrian or vehicle/mobile equipment is permitted to pass a Road Closed sign or drive through any coned off area under any circumstances without the authorisation of the Supervisor responsible for the area.

Accessing of catch benches will require risk assessment with approval by the Mine Manager

8.4.2 Prevention of Slope Failure

The following section describes the controls required to minimise the risks associated with final slope and interim slope failures. The workflow diagram for pit slope design below shows the elements, interactions, and processes for investigations, mine designs and mine operations (Figure 9).

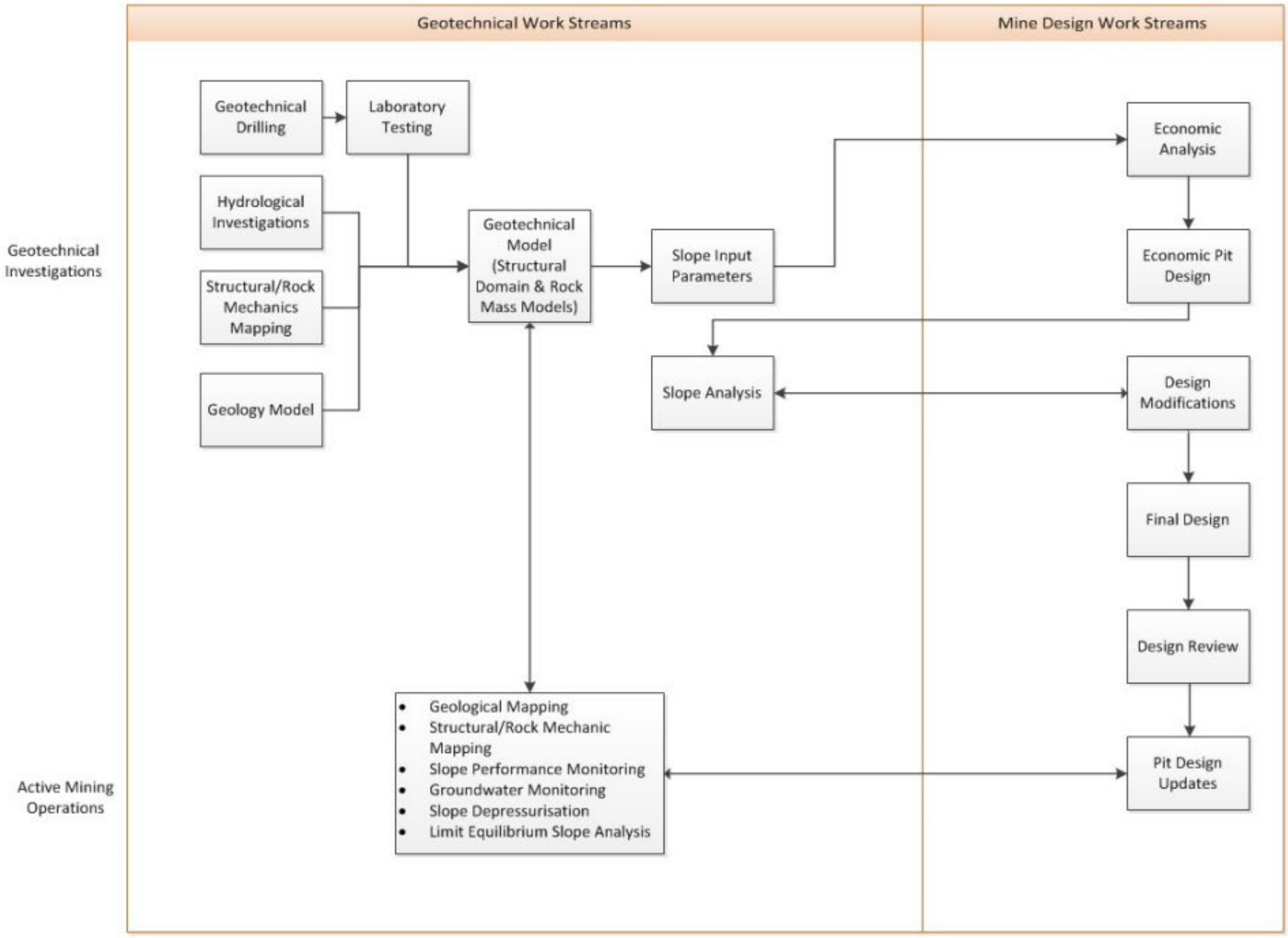

Figure 9 Pit Slope Design Flow Chart

8.4.2 Highwall or Low wall Failure

- Monitoring of excavation performance to design during excavation. GPS control in excavators. Field Survey control markers;
- Operators receive Gas and Voids, Gas Monitoring and GPS familiarisation training;
- Mine Plan and Lift Plans developed and communicated to operational teams. Mining is conducted to the plans;
- HUW for Millerton is overlaid on the Mine Plan;
- Identification of any change to the plan notified to the Technical Services team. Changes to the mine plan approved by the Technical Services Manager;
- Monitoring of weather patterns and cycles to identify weather events and restrict activities completed during this time;
- Exclusion zones developed for high walls that are at risk of failure when the monitoring system fails and or extreme weather conditions exist on site;
- Geotechnical Trigger Action Response Plan;

- Inspections by Supervisors/Mine Manager pre-shift and during shift;
- ROPS and/or FOPS on certain mobile equipment operating around crests and slopes;
- Pre-shift Inspection sheets placed on noticeboards and communicated at Prestart;
- If a Loader is to be used at the toe of a slope-risk management processes must be conducted;
- Highwall geotechnical inspections at identified frequency;
- Minimum 10 m exclusion zone at the toe of walls;
- Equipment standoff (exclusion zones) at the crest determined from the Geotech information for the highwall;
- Installation of real time monitoring system (e.g., GeoMos and Prisms) where required;
- Exclusion zones developed for highwalls that are at risk of failure when the real time monitoring system fails and or in extreme weather conditions exist on site;
- Geological and Geotechnical mapping of highwalls and data acquisition and interpretation;
- Redesign highwall if deviation from design impacts on integrity of the highwall;
- Drill and Blast designs are appropriately designed and approved by competent person; and
- Water management as per design (monitored through inspections by competent person).

8.4.3 Fall of Ground – Mangatini Sump Adit

- Constructed of competent rock mass with roof and wall bolts (areas of shotcrete);
- WRAC is completed prior to accessing the Adit (Water monitoring/Ground support Inspections);
- Mangatini underground tunnel Inspection completed quarterly or more often as required;
- Adit entry is conducted under Confined Space procedures and Permit. Atmosphere monitoring during entry (gas monitors);
- Geology and Geotechnical report - Mangatini Sump final design (URS); and
- Locked gate and signage in place. (Restricted Area).

8.5 Drill & Blast

Blast induced stability damage must be minimised. To aid this blasting within 20m of a final slope will incorporate wall control blast techniques. If blasting is required within 20m of a final slope this must be approved by the Technical Services Manager or approved delegate. Refer to ***STOC-TEC-PHMP-005 Explosives PHMP*** for further information. All blasts must be designed by a competent and experienced person and holes set out clearly in the field by Mine Surveyor or other competent personnel or utilise high precision GPS to locate the hole position and follow the requirements of the ***STO-TEC-PHMP-005 Explosives***. The site Geotechnical Engineers, Blast Engineer, Shotfirer, and Shift Supervisor shall report and document any geotechnical risks associated with blasting during any inspections, including degree of damage.

8.6 Daily Mining Operations

Several activities that may occur as part of daily mining operations were identified as having the potential to induce ground instability these are:

- Having an excess surcharge load too close to working area edges (i.e., heavy vehicles parked on the crest of cut, fill or coal stockpile faces/slopes)
- Having heavy vehicles/equipment working too close to the edge of a bench
- Excessive vibration on the crest of slopes (e.g., roadway established too close to an unstable face.

In order to address ground instability hazards undertaken during day-to-day mining activities the following guidelines and management plans need to be adhered to:

- Traffic management – Roads and Other Operating Areas PHMP
- Excavation and dumping guidelines – Tips, Ponds, and Voids PHMP
- Good Practice Guidelines Health and Safety at Opencast Mines, Alluvial Mines and Quarries' (WorkSafe New Zealand Publication)

8.7 Surface Water Management

All surface water must be managed to prevent, ponding of water above slopes, on berms, and to maintain design water levels of in pit sumps. Controlling water ingress into the mine and where it flows is essential to ensure the damage to slopes does not cause ground instability. Pit Supervisors shall inspect drainage arrangements and report any hazards or risks associated with ponding water or water ingress.

The Shift Supervisors, & Site Engineering Geologist shall also report any geotechnical risks associated with water identified during any inspections.

8.8 Cutting Walls to Design

Constructing cut slopes to design requirements is critical to achieving a stable slope. Survey control must be provided to the operations team in the form of accurate visual indicators and/or GPS for the set-out of wall crests, bench widths and RL, batter angles and toe position. The Mine Manager, Superintendent and Supervisors must undertake mining in conformance with the survey controls provided.

A detailed mine survey must be completed monthly and used to undertake an as-built versus the design conformance for completed plans, following the ***STO-TEC-DGL-001 Design Conformance Guideline***

The design conformance report that is generated will be reviewed by the Surveyor and Geotechnical Engineer, cut slopes that are outside of agreed tolerances will be assessed for geotechnical risk. Remedial work of the cut slope maybe required or redesign of the issued plan.

8.9 Prevention of Dump /Stockpile Failure

Backfill designs need to take into account the dip and dip direction of the foundation floor, proposed fill materials and placement methodology to achieve a stable backfill engineered landform dump design (ELF).

The order in which materials are placed also has an impact on dump stability. Because of this the site Geotechnical Engineer or Engineering Geologist is responsible for providing the dumping methodology to the operations team to reduce such issues. Dumping material into water greater than 1.5m in depth requires a separate geotechnical assessment and risk assessment to be authorised by the SSE and Mine Manager.

8.10 Prevention of Rock Fall

Scaling of the batter crest and slope is an essential aspect of final and interim wall construction. It is intended to remove loose materials that may form rock falls or small failures. It is a requirement that all slopes be scaled prior to the working machine moving to another mining area. The Superintendent/Supervisor is responsible to ensure this is done. Scaling must be completed with appropriately sized machinery following site requirements. If scaling cannot be completed appropriate additional controls will be required.

8.11 Modelling, Testing and Updating of Ground Support Methods

8.11.1 Geotechnical Model

A key design control is to verify the geotechnical model or modify it to take into account of new information as it becomes available during mining. The mine Geotechnical Engineer or Engineering Geologist will undertake a model review comparing assumptions to new field information as it becomes available; highlighting any areas of concern and updates made/required to the models.

Reduction in design risk of the slopes will only be achieved by improving the confidence in the geological/geotechnical model through additional data.

Design verification of the geological/geotechnical model during mining will take two primary forms:

- Updating the models as new information about the geology, structure, rock mass/defect strengths and hydrogeology becomes available, including assessment of the impacts of the new data on stability.
- Monitoring of slopes response to the mining processes of overburden and coal removal and drainage.

8.11.2 Face Mapping

Once mining commences in a new area or level of the mine, mapping of new geological exposures is to be carried out (including but not limited to lithological contacts, defects, rock mass ratings etc), analysed and the results compared with the design assumptions in the geological/geotechnical model.

A revised analysis maybe required if any of the following have been identified:

- new structures;
- changes in the geology; or,
- areas exhibiting signs of instability.

This is to be carried out by a Geotechnical Engineer or Engineering Geologist experienced in field mapping with a sound understanding of the Stockton Mine geological/geotechnical model. Any significant differences between actual and expected geotechnical factors or the geology shall be immediately reported to the Technical Services Manager who shall then review the design or planned mining sequence and recommend changes as required to ensure stability.

Significant differences would include:

- Unknown large-scale structural features running through the slope at adverse orientations;
- Presheared weak surfaces within the slope that are either weaker or more unfavourably dipping than considered in the design;
- Weaker than expected rock mass conditions around faults including wider than modelled zones of weak rock;
- The presence of a persistent rock mass discontinuities not detected in the original field investigations that are unfavourably oriented for bench stability or could lead to wedge failures within the slope; and,
- Insufficient or slower than anticipated depressurisation of critical failure surfaces affecting either interim slope or final slope stability.

8.11.3 Updating Ground Support Methods

The following generic design process is adopted for ground support methods:

- Identify mechanism of instability;
- Review potential for larger scale instability;
- Undertake back analysis of slope to confirm material parameters and what additional material testing may be required;
- Estimate extent of area requiring support;
- Select appropriate support method (e.g., shear key, buttress fill, drainage or regrade of slope)
- Undertake stability analyses to confirm support method provides adequate level of support;
- Specify complete ground support design including specific construction, maintenance, removal, and storage requirements and hold points for inspections and maintenance.

The ground support option may be required to consider the effects of earthquake loadings and surcharge loads from vehicles and machinery.

9.0 Monitoring

Monitoring will be conducted to ensure controls implemented to manage ground and strata instability risks including, but not limited to:

- Geotechnical inspections;
- Strata control hazard identification training competencies for workers;
- Supervisor inspections;
- Photographic monitoring techniques;
- Survey; and
- Electronic instrumentation and monitoring systems.

Table 1: Schedule of Inspections and Responsibilities

Area of Inspection	Responsibility	Frequency	Documented
Mine Workers own work area	Mine workers	All mine workers must take all reasonable care to inspect their work area before commencement of work and regularly throughout their shift as conditions or work areas change.	*BRL-HST-STD-001.03 Take 5* *BRL-HST-STD-002.12 Hazard Report*
Hazards	Mine workers Supervisors Competent persons	As required throughout the shift	BRL-HST-STD-002.12 Hazard Report
Work environment and individual's safety awareness, knowledge, and behaviours.	Management Team Managers Superintendents Supervisors	Routine	Safe Work Observations CCV
All active work areas where workers are or will be working	Supervisor Competent person	Before the start of each shift and at suitable times during each working shift	STO-MIN-FRM-741 Pre-shift Information – Operations STO-MIN-FRM-319 Active Mining Area Daily Inspection
Areas of the mine under the control of an active TARP or where Slope Monitoring is required 24/7	Engineering Geologist Geotechnical Engineer Competent Person	Daily or as required due to changing conditions	STO-TEC-TEM-004 Stockton Mine Geotechnical Assessment Short Memo
All other accessible areas of the mine including where barriers are in place and where machinery is parked. (Every accessible area of the mining operation, including every area containing barriers, machinery, seals, underground or surface infrastructure, and ventilation stoppings)	Supervisor Competent person	Weekly or as required due to changing conditions	STO-MIN-FRM-741 Pre-shift Information – Operations BT-HS-F5 Mining Area Inspection Weekly Mining Manager

Area of Inspection	Responsibility	Frequency	Documented
On a weekly basis a suitably qualified person is to undertake a visual inspection (including monitoring where required)of all active work areas for features such as, but not limited to: Formation and widening of tensile cracks; instability; exposure of faults/shear zones; bulging of the slope face or toe; ravelling of rock down the slope; water seepage and/or increased water seepage; overhangs; assessment of all potential mechanisms that could control instability; blast damage; slopes, benches and step-backs constructed as per design parameters. Findings will be documented and communicated.	Engineering Geologist Geotechnical Engineer Competent Person	Weekly or as required due to changing conditions	STO-TEC-TEM-004 Stockton Mine Geotechnical Assessment Short Memo
Monthly As-built vs Design Checks	Engineer Surveyor	Monthly or as required due to changing conditions	STO-TEC-DGL-001 Design Conformance Guideline
Geotechnical Inspection of all large water bodies or dams	Engineering Geologist Geotechnical Engineer Competent Person	3 Monthly or as required due to changing conditions	Dam Geotechnical Inspection Forms
Reassessment of the stability of the tip, pond, or void is carried out by a competent person: (a) at least once every 2 years after the date on which the principal hazard management plan is made; and (b) if a tip, pond, or void as constructed deviates from the geotechnical design; and (c) if a new tip, pond, or void is created.	Engineering Geologist Geotechnical Engineer Competent Person	At least once every 2 years after the date on which the principal hazard management plan is made	Geotechnical Report

Area of Inspection	Responsibility	Frequency	Documented
Mine Manager Weekly and SSE Monthly Inspection of all accessible mining areas	Mine Manager and SSE	Weekly	Mine Manager and SSE Weekly Inspections
Daily Inspection of Coal Fines Storage Facility	CHPP Supervisor	Daily or as required due to changing conditions	CHPP Daily Inspection Report
Yearly external engineering inspection/review of the A18 CFSF and the McCabes CFSF must be completed as it is classified as a large dam.	Suitably qualified external engineer (Organised by the Geotechnical Engineer)	Yearly	Engineers Report
5 yearly external engineering inspection/review of the A18 CFSF and the McCabes CFSF must be completed as it is classified as a large dam.	Suitably qualified external engineer (Organised by the Geotechnical Engineer)	5 Yearly	Engineers Report

Defects/issues identified must be reported and entered into INX with the appropriate corrective action(s) taken documented or required assigned. For further information regarding monitoring refer to Health and Safety at Opencast Mines, Alluvial Mines and Quarries November 2015 Good Practice Guidelines.

9.1 Trigger Action Response Plans (TARPs)

Trigger Action Response Plans (TARPs) provide technical personnel with guidance on actions to be taken in response to pre-determined indicators that may be identified through personal observation or through the mine inspection system.

Trigger Action Response Plans provide a step-by-step approach for the rectification of issues as they become apparent in areas of Ground and Strata Instability:

- ***STO-TEC-PHMP-002.02 Ground and Strata Generic TARP (Attachment 2);***
- ***STO-TEC-PHMP-002.02 Dump Stability Generic Trigger Action Response Plan (Attachment 3);***
- ***STO-TEC-PHMP-002.02 Cypress Highwall exclusion zones TARP (Attachment 4); and***
- ***Adverse Weather TARP within the STO-HST-PCP-002 Emergency Management Principal Control Plan (EMPCP).***

TARP performance will be monitored, and TARPs reviewed through additional geotechnical review and risk assessment if required.

9.2 Inspections

The Mining Supervisor is responsible for:

- Conducting a pre-shift inspection of all work areas (including ground and strata hazards) prior to work commencing. Further inspections will occur throughout the shift to identify any changed conditions or developing hazards in accordance with the ***BRL-HST-STD-006 Workplace Inspection Standard.***
- Supervision of dumping operations.

The Mining Supervisor must hold a minimum of a B-Grade Open Cast Coal Mine Manager Certificate of Competence (CoC).

The Mining Supervisor will record the results of inspections including any identified ground or strata instability hazards on the ***Operations Daily Workplace Inspection Form*** and the ***Mining Area Inspection Form*** including any action taken/required to remedy. Where a ground or strata instability hazard poses an unacceptable level of risk, the Mine Manager (or their delegate) must be notified, and operations must cease until the hazard has been rectified or the area made safe prior to any work recommencing. Any concerns will be included in the shift handover notes for communication to the oncoming crew.

Workers must report any adverse changes to conditions as observed throughout the shift to the Mining Supervisor.

If work has stopped in an area for any period of time (e.g., due to weather), the Mining Supervisor will ensure that another inspection of work areas is completed prior to restarting work. This inspection must also be documented.

A daily inspection of all areas under the control of a TARP or an active area under 24/7 slope monitoring is to be undertaken by either the site Geotechnical Engineer or Engineering Geologist.

A record of the inspection will be documented on the ***STO-TEC-TEM-004 Stockton Mine Geotechnical Assessment Short Memo***. The Technical Services Manager, Mine Manager, and Operations Superintendent is to be notified of new hazards identified during the inspection.

All records of inspections must be maintained in the site Health, Safety, Environment and Community Management System (HSECMS).

9.3 Communication of Ground and Strata Instability Hazards

Identified ground and strata instability hazards will be communicated to site workers via the following:

- Publishing of dig plans to relevant team members;
- PSI meetings and notices for changes to new and existing geotechnical hazards and or exclusions zones;
- Hazard Alerts relating to changes in the mining environment, new hazards identified or reported in Hazard and Incident Reports. Hazard Alerts shall include the planned methods of dealing with the hazard;
- Void Hazard Plans;
- Updated stage plans to deal with changes as necessary;
- Shift briefings and toolbox talks; and • Principal Hazard Plan Presentations.
- Principal Hazard Plan Presentation

10.0 Reviews of completed Mining Areas

Mining area reviews should be undertaken in sufficient detail following key operational stages (commensurate with the potential risk exposure to workers) by operational and technical management to provide meaningful and timely input into the mining review process. The mining review should include the following:

- Reconciliation of the occurrence of actual features compare to predicted features;
- Sufficiency of exploration data to accurately characterise the mining conditions;
- Causes of unplanned failures which occurred;
- Audits and reviews;

- Adequacy of monitoring and analysis of data;
- Suitability of design factors used, including equipment selection; and
- Pit wall management methodologies and working methods.

11.0 Plans of the Mining Operation

Mine plans are prepared using the Buller Circuit 1949, in a suitable scale, by a competent opencast mine surveyor and available for inspection by mine workers at all times at the mine site.

Mine plans are reviewed and updated as required:

- At least every 3 months;
- When there is a material change to the mining operation; or
- If mining has been suspended, prior to mining recommencing.

As per the HSW (MOQO) Regs, all plans, drawings, records, and reports associated with the mine are to be submitted to the Inspector within three months of abandonment or before parting with the whole of the premises.

11.1 WorkSafe

A copy of the mine plan must be submitted to WorkSafe:

- For the first time, as soon as practicable after the completion of the plan;
- 12 monthly after that date; and
- Whenever any significant changes are made to the plan.

12.0 Training and Competency

Training and awareness at Stockton mine will be carried out to ensure compliance with this PHMP in accordance with the ***BRL-HST-STD-Training Standard*** and the site Training Needs Analysis.

The responsible manager will ensure that each person and/or Contractor/Consultant employed on a geotechnical project is competent with respect to the activities being conducted. General experience requirements are presented as a guide (Table 2). Field personnel involved in geotechnical inspections and monitoring must be made aware of the key issues and data collection/reporting requirements and deemed competent by the Mine Engineer.

Table 2: Competence Requirements for Geotechnical Monitoring & Specialists

Task	Minimum Specific Experience (years)**		
Open Pit	Simple Structure (<1yr mine life)	Moderate Structure (1yr<mine life<3yr)	Complex Structure (Mine life>3yr)
Data Collection and instrumentation	Persons deemed competent by geotechnical specialist	Persons deemed competent by geotechnical specialist	Persons deemed competent by geotechnical specialist
Stability analysis and slope design	>3	>5	>8
Slope design review	>5	>10	>10
Geohydrology & review	>5	>10	>10
Stability analysis & design review	>5	>10	>10

*****This is intended as a guide only and requires that the experience reflects appropriate skills training.***

12.1 Geotechnical Awareness Training

In addition to basic risk management competencies, all personnel required to work in and around areas where there is a potential of exposure to ground or strata instability risks, will be provided with Geotechnical Awareness Training. The training package has been developed to specifically address the identification of site failure mechanisms to assist with the early identification of geotechnical hazards, the correct assessment of safe working conditions and the appropriate response to an impending ground or strata failure.

12.2 Emergency Management

Emergency Response at Stockton mine is managed in accordance with the ***STO-HST-PCP-002 Emergency Management Plan.***

13.0 Roles and Responsibilities

Details of roles and responsibilities associated with this PHMP are provided in Table 1.

Table 3: Roles and Responsibilities

Position	Accountable Task
Site Senior Executive	• Ensure adequate resources are available for the implementation of this plan. • Ensure this plan is audited for effectiveness.

Position	Accountable Task
	• Ensure this plan is reviewed and updated. • Identify falls of rock or coal and facilitate an investigation and independent review of ground support in accordance with HSE Reg 131 if required. • Formally appoint suitably qualified persons to key ground control positions. • Approve any deviation between operating plans and the GSI-PHMP.
Mine Manager	• Provide adequate resources for the implementation of this GSI-PHMP. • Ensure the controls herein are implemented, maintained and effective. • Ensure persons (including contractors) working at the operation who are affected by the requirements of this GSI-PHMP have been given a copy of the GSI-PHMP and are aware of the requirements. • Ensure that the mine plan conforms with the recommendations of the geotechnical assessment and this GSI-PHMP. • Inspections, audits, and reviews of the implementation of the GSI-PHMP are carried out regularly, documented, and corrective actions are implemented.
Superintendent/ Supervisors	• Ground conditions are inspected prior to and during work activities, responsible staff are alerted, and appropriate corrective actions are implemented. • All pit walls are routinely inspected for geotechnical hazards and any relevant hazards are communicated to mine workers working in the area. • Implement and comply with the PHMP controls/requirements • Ensure a risk assessment is completed (and have it approved by the Mine Manager) if the slope or backfill is outside of the PHMP guidelines. • Do not leave any cut faces with overhangs • Inspect drainage arrangements and report any hazards associated with ponding water or water ingress. • Ensure all slopes are scaled prior to the working machine moving to another mining area. • After an earthquake check welfare of personnel in the pit then organize the pit to be evacuated. If offices are damaged, they are also to be evacuated. • Document any of the following hazards during daily inspections and communicate hazards to mine workers in the area: o Any signs of instability or steep/high cut faces.

Position	Accountable Task
	○ Current cut faces; identifying overhangs, cracking, water seeps of ponding on the floor and on top of walls; ○ Appearance of geological structures or changes in geology that may affect stability ○ Walls, benches, catch benches, batters, associated pedestrian control zones ○ Provision of edge protection and visual barriers ○ Survey control visual indicators ○ Stability of ramps ○ Overburden dumping areas; monitoring the face and slopes of tip heads and dumping areas for water seeps, washouts, cracking, or slumping ○ ROM Stockpiles; monitoring construction, existing and reclamation of coal stockpiles for cracks, slumping, water seeps or ponding • When trigger levels set out in TARP's or guidelines are reached, ensure that required responses are implemented.
Technical Services Superintendent	• Implement and comply with the GSI PHMP controls • Ensure that the geotechnical requirements are considered as part of the mine plan • Ensure CCVs are completed • Ensures liaison occurs with mine planning, geology and geotechnical engineering staff where required. • Ensure a risk assessment is completed (and have it approved by the Mine Manager and SSE) if the slope or backfill design is outside of the PHMP guidelines. • Provide designs to the operational team as part of the mine planning process. • Approve any blasting within 20m of a final slope • Ensures the GSI-PHMP is effective. • Inspections, audits, and reviews of the implementation of the GSI-PHMP are carried out regularly, documented, and corrective actions are implemented. • Deem persons other than Mine Manager, Geologists and Geotechnical Specialists competent to undertake inspections and monitoring tasks.
Mining Engineer	• Implement and comply with the PHMP controls/requirements • Develop mine plans so that the mining sequence does not have a negative impact to the interim cut slope. • Develop mine plans so that the mining sequence leaves a geotechnical • Stable final slope.

Position	Accountable Task
	• Redesign mine areas identified at risk of failure as directed by the • Geotechnical Professional. • Complete mine design work streams and develop slope designs that conform to the slope and backfill design criteria and controls in the GSI PHMP. • Ensure conformance of as built to approved designs is monitored monthly and any significant deviations reported to the Mine Manager as soon as possible. • Complete inspection and monitoring requirements
Engineering Geologist	• Maintain a robust geotechnical assessment by a competent person for pit Footwall, Hanging Wall, dump, and dam stability. • Ensure that there is an adequate geological model which includes all main lithologies that are likely to impact upon the stability of the ground. • Geotechnical data and design recommendations are periodically reviewed and that the GSI-PHMP is updated as necessary and that any changes are communicated to all related parties. • Ground conditions at actives faces are inspected and monitored regularly. • Required geotechnical and hydrogeological data is collected, analysed, and interpreted. • Slope monitoring systems are used and results are analysed and anomalies reported. • All significant slope failures are investigated and reported. • Demarcation and reporting of any geotechnical hazards. • Produce and issue the Geotechnical Summary Reports • Inspect new geotechnical/ geological exposures identified as required. • Compare new exposures to design assumptions in the geological model and address any changes required to the design or mining sequence. • On a weekly basis conduct a visual walkover and photographic inspection of active work areas. • Management of the TARP Board for Ground & Strata, Tips & Dumps, & Cypress Highwall
Mine Surveyor	• Pit designs are pegged in the field to enable construction. • Deviations from design are reported to the Mine Engineer and rectified through regular QA/QC checks of the Pit “as built” compared to design. • As built surveys are undertaken, and records maintained.

Position	Accountable Task
	• Slope monitoring marks are installed as mining progresses and are surveyed at the frequency required in the GSI-PHMP. • Geotechnical Hazard Maps are updated as required. • Hold relevant competencies required
All Workers	• Comply with the requirements of the GSI-PHMP. • All ground related hazards identified are reported to Shift Supervisor and geotechnical staff. • Monitor the ground conditions during the shift for the occurrence of rock falls or unusual geotechnical events.

14.0 Corrective Action

Any corrective action identified as a result of an incident, or an audit will be entered into the corrective action data base and reviewed to ensure closeout of identified actions. Refer to ***BRL-HST-STD-007 Non-Conformance and Corrective Action Standard***.

15.0 Audit and Review

The mine will be audited against the requirements of this PHMP and the appropriate legislative requirements as per the ***BRL-HST-STD-008 Audit Standard***.

A review of this document will routinely occur every two years unless there is a trigger which necessitates an immediate review.

16.0 Document Control and Record Management

16.1 Document Control

Document control will be in accordance with the ***BRL-HST-STD-003 Document Control Standard***.

16.2 Records Management

This document is issued, revised, and amended under authorisation of the SSE.

A copy of this PHMP will be stored electronically with access available to all workers. The signed hard copy will be maintained in the site library.

Reasons for making changes to this PHMP will be documented and recorded in the document management table (

Table 4). A copy of the original document and subsequent versions will be kept for records and marked as obsolete. Each new/updated version will be issued with a version number and date to eliminate obsolete documentation being used.

Table 4: Document Management Table

Document Management			
Document Owner Name:	[redacted]		
Document Owner Role:	[redacted]		
Document Owner Approval Signature:	**Provided**		
Date:	**30/08/2023**		
SSE Name:	[redacted]		
SSE Signature:	**Provided**		
Date Approved:	**30/08/2023**		
Revision history:			
Date	**Version No.**	**Lead Author**	**Contributing Authors**
01.09.2018	1.0	[redacted]	[redacted]
28.02.2019	2.0	[redacted]	[redacted]
09.09.2020	3.0	[redacted]	[redacted]
18/01/2022	3.1	[redacted]	
25/07/2023	4.0	[redacted]	[redacted]

Version No.	Detail / Changes
1.0	Stockton Document 4858-HS-PHMP1003 adopted by BRL and renumbered STO-TECPHMP-002. BRL template applied. No Content changes from 4858 Document.
2.0	Full Review
3.0	Full Review
3.1	Minor Version Change – BBRA action completed to Ground and Strata TARP
4.0	Full Review

NEXT PLANNED REVIEW:
August 2026

17.0 Glossary of Terms and Abbreviations

Table 5: Glossary of Terms and Abbreviations

Term /Abbreviations	Definition
BBRA	Broad Brush Risk Assessment.
BRL	Bathurst Resources Limited.
Consequence	The outcome of a risk if it occurs.
Control	The means used to manage risk.
Emergency	A situation that is developing or has developed suddenly and unexpectedly and poses a threat to Life, Property, or the Environment.
EM-PCP	Emergency Management Principal Control Plan.
Hazard	A source of or a situation with the potential to cause loss.
HSECMS	Health Safety Environment and Community Management System
Incident	An unplanned event or occurrence.
Likelihood	The chance that a particular risk will occur. Sometimes referred to as probability.
Must	Mandatory
PHMP	Principal Hazard Management Plan.
Principal Hazard	A hazard with the potential to cause multiple fatalities.
Risk	A measure of Consequence and Likelihood for an unwanted event developing from a hazard.
Risk Assessment	The process of risk identification and risk evaluation.
Risk Identification	A structured process to identify unwanted events which could develop from hazards.
Standard	An acceptable measure of performance or quality that determines the minimum criteria required to ensure a safe and healthy work environment. Understood to be non-mandatory, advising or recommended.
SSE	Site Senior Executive.
TARP	Trigger Action Response Plan – Pre-determined actions to be taken in the event of an alarm or trigger level being reached.

18.0 Attachments

18.1 Attachment 1: Requirements of the Relevant Legislation

Requirements of the HSW Act	Section where addressed
Regulation 71 – Principal Hazard Management Plans for Ground or Strata Instability	5.0
(1) If ground or strata instability is identified as a principal hazard at a mining operation, an A-grade quarrying operation, or an A-grade alluvial mining operation, the responsible person for the operation must ensure that a competent person completes a geotechnical assessment to determine the level of ground or strata support required to safely conduct the operation	
(2) A principal hazard management plan in relation to ground or strata instability must, at a minimum, address the following:	5.2
(a) the circumstances under which ground or strata failure may occur at the operation; and	
(b) the ways in which potential ground or strata failure could be avoided through the design of suitable ground or strata support methods that must have regard to	5.3, 7.5
i. the characteristics of the area to be supported, including natural and geotechnical features;	
ii. the surrounding workings, including abandoned or previously excavated workings;	
iii. the activities to be carried out, including proposed activities;	
iv. in relation to underground mining operations and tunnelling operations, the size and geometry of the openings in the underground workings; and	
(c) suitable ground or strata support methods that are able to be implemented by means of clear directions and diagrams; and	7.0
(d) continuous modelling, testing, and updating, where required, of the ground or strata support methods; and	8.11
(e) the appropriate equipment and procedures to monitor, record, interpret, and analyse data about seismic activity and its impact on the mining operation; and	7.4
(f) the collection, analysis, and interpretation of relevant geotechnical data, including monitoring of openings and excavations, where appropriate; and	**8.11**
(g) the maintenance of the integrity of ground or strata support, including, for example, by replacing defective supports; and	
(h) allowing for higher standards of support to be installed (for example, more support installed at more frequent intervals) than that required by the principal hazard management plan.	**8.11**

Requirements of the HSW Act	Section where addressed
Regulation 117 – Installation of ground or strata support (1) The relevant operator must ensure that (a) no person enters an area of the mining operation that has unsupported ground or unstable strata unless that person is - (i) installing or supervising the installation of ground or strata support; or (ii) undertaking or supervising slope stabilisation, and (b) temporary support is provided to protect a worker from a hazard associated with unsupported ground or unstable strata when the worker is— (i) installing or supervising the installation of ground or strata support; or (ii) undertaking or supervising slope stabilisation.	5.3
Regulation 118 – Obligations relating to ground or strata support (1) The manager must ensure that – (a) that suitable ground or strata support arrangements, or slope stabilisation arrangements, are designed and implemented for all working areas, in accordance with regulation 117; and (b) that plans showing the ground or strata support arrangements put in place are displayed in locations readily accessible to all mine workers.	8.4.2
Regulation 213 Plans of Mining Operation (1) The mine operator must ensure that a plan is made of the mining operation as at the date of commencement of the mining operation, to be used by the mine operator for operational purposes. (2) The mine operator must ensure that the plan of the mining operation is reviewed and, if necessary, updated- (a) at least once every 3 months in relation to the parts of the plan that identify points of access, exits, and refuges: (b) when there has been a significant modification to the mining operation: (c) if the mining operation has been suspended, before the mining operation recommences: (d) otherwise, at least once every 6 months (3) The plan, including any updated plan, must-	11.0

Requirements of the HSW Act	Section where addressed
(a) be prepared by a mine surveyor using the New Zealand Geodetic Datum 2000 and to a suitable scale; and (b) be kept at the site office; and (c) be available for inspection at all times at which a mine worker is present at the mining operation.	
Regulation 214 Duty to give copy of plan of mining operation to WorkSafe (1) The mine operator must ensure that a plan of the mining operation is prepared and updated for the purposes of complying with subclauses (2) and (3). (2) The mine operator must give the plan to WorkSafe— (a) as soon as possible after the date of commencement of the mining operation; and (b) at intervals of 12 months after giving the plan to WorkSafe for the first time under paragraph (a). (3) In addition, the mine operator must update the plan, and provide the update to WorkSafe, whenever there has been a significant modification to the mining operation. (4) The mine operator must ensure that the plan, including any updated plan, — (5) The plan, including any updated plan, must be prepared by a person who holds a current certificate of competence as a mine surveyor. (6) In the case of an opencast mining operation or a tunnelling operation, the plan or updated plan may alternatively be prepared by a licensed cadastral surveyor. (6A) In addition, a person referred to in subclause (5) must hold a current certificate of competence that includes any additional or alternative requirements that— (a) are prescribed in accordance with regulation 34(5)for the certificate of competence as a mine surveyor that must be held by a person who prepares a plan or an updated plan; and (b) relate to the type of operation for which the person is preparing the plan or updated plan.	11.0

PERSON / ACTION	GROUND AND STRATA GENERIC TRIGGER ACTION RESPONSE PLAN (TARP)			
LEVEL	**Normal Operating Conditions**	**Yellow - Level 1**	**Orange - Level 2**	**Red - Level 3**
TRIGGER	• Slopes stable (no seepages, tensions cracks or headscarps developed) • No Movement measured through slope monitoring system (radar or GeoMos)	• Minor instability observed (bench scale) • Localised headscarp and /or tension cracks developed • Potentially minor seepages or changes to existing seeps • Movement reported through slope monitoring system (IDS Radar or GeoMos) at a rate of <0.12m per day • No bulging of cut at toe of slope. **Any identified movement is:** – ***Slow creep movement*** *(< 0.12m slumping (vertical movement) per day);* – ***Dump development as per plan / design;*** – ***Cut slope as per plan*** – ***Adequate survey control in place*** OR • Remediating a small, failed area (bench scale) which has stabilised	• Moderate instability observed (bench to multibench scale) • Increasing rate of displacement / opening across headscarps and / or tension cracks • Headscarp of slumps and / or tension cracks encroaching on windrows and verges of haul roads • Movement reported through slope monitoring system (IDS Radar or GeoMos) at a rate of >0.12m per day • Minor bulging of cut at toe of slope. **Any identified movement is:** – ***Slow creep movement*** *(> 0.12m to < 1m slumping (vertical movement) per day);* – ***Fast vertical movement*** *between 0.5m and 1m over a short duration of time (< 1 hr);* OR • Remediating a failed area (multi bench scale) which has stabilised	• Major instability observed (slope at imminent risk of failure) • Regression of headscarp and widespread tension cracks developed • Tension cracks and/or headscarps may have opened in actively used haul road. • Rate of movement at toe of slope potentially noticeable to the naked eye **Any identified movement (through slope monitoring Radar, GeoMos, Extensometers, or visual is:** – ***Slow creep movement*** *(> 1 m slumping (vertical movement) per day);* – ***Fast vertical movement*** *> 1 m over a short duration (< 1hr);*
ACTIONS	• Monitor slope	• Monitor slope • NO STOPPING within 20m of toe of potentially moving slope	• Increase frequency of slope monitoring and haul road inspections • NO STOPPING within 20m of toe of potentially moving slope • Area to be designated an exclusion zone with hard barriers as required	• STOP work within 50m of toe / or crest of slope below / above movement area • Area to be designated an exclusion zone with hard barriers as required
MINE WORKERS	• Report any hazards observed to supervisor	• Report any hazards and changes observed to supervisor	• Report hazard and changes to supervisor and await instructions	• STOP and contact supervisor for further instructions
PRODUCTION SUPERVISOR **It is the responsibility of the Supervisor to ensure this TARP is activated**	• Regular inspections of slope and road conditions during shift – report any cracks, seepages in slope, opening of headscarps, and bulging of slope to Mine Manager and Engineering and Geologist	• Regular inspection of slope and road conditions during shift – report any new cracks, seepages in slope, change in position of headscarps, bulging of slope and change in size of slope failure to Mine Manager and Engineering Geologist	• Inspect slope and/or road conditions a minimum of every 3 hours during shift whilst actively working in affected area – report any changes to • Mine Manager and Engineering Geologist	• STOP using affected work area and NOTIFY Mine Manager, SSE, and Engineering Geologist of change in slope failure. • No personnel or equipment within 50m of toe / or crest of failing / failed slope
MINE GEOLOGIST/ GEOTECHNICAL ENGINEER	• Daily/Weekly Geotechnical Inspection	• Daily Geotechnical Inspection (when work area is active)	• Inspect and assess stability implications of increased slope movement; • Advise on safety implications to Mine Manager and SSE	• Assess situation and provide advice to Mine Manager and SSE; • Undertake remedial design options to reinstate adequate stability • Present design options to Mine Manager and SSE
SURVEY and Monitoring	• Monthly survey of active areas	• Survey monthly • Additional survey monitoring as required • Install monitoring equipment as required	• Survey monthly • Additional survey monitoring as required • Install monitoring equipment as required	• As required
MINE MANAGER	• Regular Inspections	• Regular Inspections	• Ensure SSE notified. • Implement remedial action as agreed with SSE and Geotechnical Engineer	• Ensure equipment and personnel moved a minimum of 50m from toe / or crest of slope. • Ensure haul road coned off. • Ensure SSE notified • Implement remedial actions as agreed with SSE and Geotechnical Engineer