

AGL Loy Yang

**Mine Licence
Risk Assessment**

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1 EXECUTIVE SUMMARY

In January 2015, the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) amended AGL’s Mine Licence 5189 [1] (“the mine licence”) to include a new licence Condition 1A – Risk Management. This condition specifies that a Risk Assessment and Management Plan is required to address the risks to the environment and public safety for the open cut operations covered by the mine licence.

R4Risk was engaged by AGL Loy Yang Pty Ltd (AGL) to undertake the risk assessment for its Loy Yang Mine (“the mine”). This assessment was conducted to meet the requirements of the risk assessment component within Condition 1A – Risk Management.

The assessment was conducted in two phases:

- Phase 1: Initial Review
- Phase 2: Hazard identification (HAZID) and risk assessment workshop.

The initial review included the review of AGL’s existing hazard registers and records of previous assessments to draft a preliminary list of hazards, causes and risk controls. This information was used to develop draft bowtie diagrams. A HAZID and risk assessment workshop was then conducted to review the list of hazards and identify any new potential hazards. Each identified hazard was subsequently assessed using the bowtie approach. A semi-quantitative risk assessment of the hazards was conducted utilising AGL’s Fully Integrated Risk Management (FIRM) assessment matrix [2].

The workshop involved key AGL personnel and independent experts with the appropriate level of experience in their respective area of the assessment. Fifteen potential hazards were identified in the HAZID workshop and these were further assessed in the risk assessment workshop. A summary of the potential hazards and the risk assessment is presented in Table 1.

Table 1: Summary of Risk Assessment

Hazard ID & Hazard	Impact Description	Consequence Rating	Current Risk	Future Risk
RR-R-00061 Impact to Water (Level 1/2)	Contaminated water discharge with the potential to impact the environment.	Level 2	Moderate	Moderate
RR-R-00062 Impact to water (Level 3)	Contaminated water discharge with the potential to impact the environment.	Level 3	Low	Low
	Loss in biodiversity: vegetation, habitat destruction, threatened species.	Level 3	Low	Low
	Loss of water usage downstream	Level 3	Low	Low
RR-R-00063 Impact to water (Level 4)	Contaminated water discharge with the potential to impact the environment.	Level 4	Moderate	Moderate
	Change in creek grade with the potential to impact the environment	Level 4	Moderate	High ¹
RR-R-00064 Impact to regional aquifers	Damage to regional aquifers	Level 3	Moderate	Moderate
RR-R-00065 Impact to land (Level 1/2)	Ground movement / land degradation with the potential to impact the environment.	Level 1	Moderate	Moderate

¹ The future development associated with the planned Traralgon Bypass is expected to impact the surface water and mine stability. This development as currently proposed presents a potential *High* risk into the future.

Hazard ID & Hazard	Impact Description	Consequence Rating	Current Risk	Future Risk
RR-R-00066 Impact to land (Level 3)	Ground movement / land degradation with the potential to impact the environment.	Level 3	Low	Low
	Ground movement / land degradation with the potential to impact public safety.	Level 3	Low	Low
RR-R-00067 Impact land (4/5)	Ground movement / land degradation with the potential to impact public safety	Level 4	Moderate	High ¹
	Settling Pond dam wall failure induced flood event with the potential to impact public safety.	Level 5	High	High
	Ground movement / land degradation with the potential to impact the environment	Level 4	Moderate	High ¹
RR-R-00068 Fugitive dust emissions	Fugitive dust emissions with the potential to impact public safety.	Level 2	Moderate	Moderate
	Loss of amenities due to fugitive dust emissions (visual/nuisance).	Level 3	Moderate	Moderate
RR-R-00069 Noise emissions	Noise emissions with the potential to result in nuisance or loss of amenity to the local community.	Level 3	Moderate	Moderate
RR-R-00070 Visual light emissions	Visual light emissions with the potential to result in nuisance or loss of amenity.	Level 1	Low	Low
RR-R-00071 Post rehabilitation/fire	Fire risk with the potential to impact public safety.	Level 5	N/A	High
	Environmental impacts from unsuccessful rehabilitation - Land, Aquifer and Surface Water.	Level 3	N/A	Moderate
	Smoke risk with the potential to impact the public safety	Level 5	N/A	High
	Environmental risk from smoke with the potential to impact public amenities.	Level 3	N/A	Low
RR-R-00072 Hazardous chemicals	Contaminated water discharge with the potential to impact the environment.	Level 3	Moderate	Moderate
	Contaminated land with the potential to impact the environment	Level 2	Moderate	Moderate
RR-R-00073 Mine fire	Fire risk with the potential to impact public safety.	Level 5	High	High
	Smoke risk with the potential to impact the public safety	Level 5	High	High
	Environmental risk from smoke with the potential to impact public amenities.	Level 3	Low	Low
RR-R-00074 Gas pipelines fire/explosion	Natural gas pipeline leak and associated fire/explosion with the potential to impact public safety	Level 5	High	High
RR-R-00075 Criminal act	Criminal related hazard with the potential to impact the environment.	Level 3	Low	Low
	Criminal related hazard with the potential to impact the public safety.	Level 5	High	High

Twenty-seven recommendations were raised to improve the performance of existing controls, or implement additional controls.

The HAZID and risk assessment process conducted has assisted in demonstrating that the environmental and public safety risk associated with the potential hazards of AGL's mine operations as defined in the Mine Work Plan [3].are identified, risk assessed and that reasonable practical actions were identified as required by Condition 1A.

2 ACRONYMS

AGL	AGL Loy Yang Pty Ltd
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
FIRM	Fully Integrated Risk Management
HAZID	Hazard identification
HSE	Health, Safety & Environmental
RRAM	Resource Rights Allocation and Management

3 INTRODUCTION

AGL is the licenced operator of the Loy Yang Mine. DEDJTR has amended AGL's mine licence to include a new Condition 1A – Risk Management. For this new condition, AGL is required to undertake a risk assessment and submit a Risk Assessment and Management Plan for the mine to DEDJTR. A Risk Assessment and Management Plan should address the risks to the environment and public safety for the open cut operations covered by the Mining Licence 5189 (mine lease area) [1].

R4Risk was engaged by AGL to assist with the risk assessment component within Condition 1A – Risk Management.

The aim of this assessment was to ensure that the risk associated with the environment and public safety for the operations within the mine lease area are identified, risk assessed (considering the likelihood and consequence) and that reasonable practical actions are identified. This assessment included all work done or proposed to be done as defined in the Mine Work Plan [3].

3.1 FACILITY DESCRIPTION

The mine is situated in the Latrobe Valley approximately 160 km east of Melbourne [4]. It is an open-cut mine that produces 30 million tonnes of brown coal annually for the Loy Yang A & B Power stations. The station provides approximately 50% of the total coal-fired electricity generated in Victoria. The mine is currently about 170 m deep, 4 km long and 2.5 km wide at its widest. Approximately 28 to 32 million tonnes of coal is extracted from the open cut mine each year.

The mine's primary operations includes the excavation of material by bucket wheel excavators (dredgers), transport via conveyors and dumping of waste by tripper stackers. Coal is transported, using belt conveyors to the raw coal bunker for short term storage (less than a day), then onto the crusher for sizing before delivery to the power station bunkers. Mine operations use dredgers, tripper stackers, mobile plant and conveyor systems to dig and transport coal and dispose of waste. The mine operates 24 hours a day, 365 days a year.

The open cut operations are covered by Mining Licence 5189 and the Mine Work Plan. The area covered by the mine lease area is 4,561.4 hectare and is defined as the area in between the purple lines as shown in Figure 1. The Loy Yang A and B Power Stations are located on an area excluded from the mine lease area.

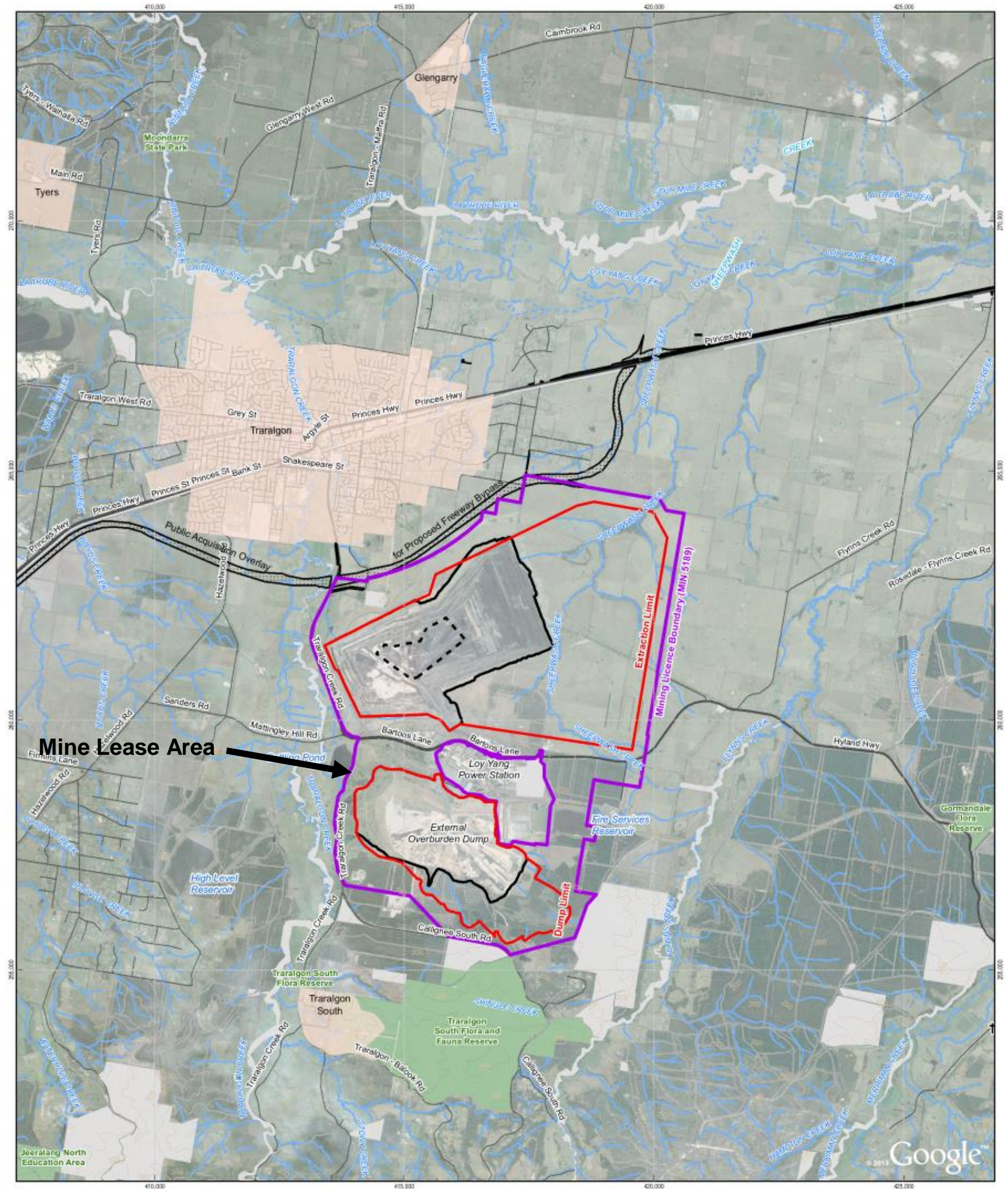


Figure 1: AGL Loy Yang Mine Lease Area [5]

4 RISK ASSESSMENT METHODOLOGY

This section describes the process undertaken at AGL to comply with the risk assessment component of Condition 1A - Risk Management.

4.1 RISK ASSESSMENT SCOPE, HAZARD DEFINITION AND RISK CRITERIA

This section contains the scope of the risk assessment, the definition of a hazard and the risk tolerability criteria used to assess the risks.

4.1.1 Risk Assessment Scope

The scope of the risk assessment was limited to operations at the mine that may impact the environment and/or public safety within or beyond the mine lease area [1]. This included all activities and/or operations undertaken within the mine lease area, considering the following:

- All worked out areas, current workings and areas yet to be worked within the mine lease area as defined in the Mine Work Plan as per the mining licence;
- Rehabilitation activities post mine closure.

Facilities operated by AGL e.g. the Loy Yang A Power Station, High Level Storage Dam, Settling Pond etc. that may impact the environment and/or public safety were excluded from this assessment. These facilities were excluded as they are located outside the mine lease area. However the assessment included potential hazards that these facilities may pose to the mine.

4.1.2 Hazard Definition

The FIRM risk assessment matrix [2] was expanded to include consequence description ratings for public safety hazards as these had not been previously described on the matrix. A hazard must have the potential to pose a risk to the environment or public safety for it to be included in the scope of this assessment. This is defined using the FIRM risk assessment matrix, as follows:

- Level 1 - 5 on the environmental consequence scale and;
- Level 2 - 5 on the public safety consequence scale.

The definitions of the consequence rating are presented in Table 2.

Table 2: AGL FIRM Matrix - Consequence Rating

Consequence Descriptor	Environment & Community Definition	Public Safety Definition
Level 1	Negligible and short term environmental impact to localised area of negligible environmental value. No impact beyond AGL's operational area. No interest by local community.	No offsite public safety impact
Level 2	Small scale and short term environmental impact to localised area of low environmental value.	Nuisance event to public safety (no medical attention). Minor social or health impacts on local population.
Level 3	No impact beyond AGL's operational area. No/minor interest by local community."	Injury to a member of the public, (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours). Ongoing social or health impact concerns.
Level 4	Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Serious harm to a member or injury to members of the public. Members of the public required to be displaced for a long period of time (days). Ongoing serious social or health impact.
Level 5	Significant medium term impact on important environment/habitat and/or widespread local community complaints.	Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks). Widespread ongoing significant or reversible social or health impacts.

4.1.3 Risk Assessment Criteria

AGL risk assessment evaluation process was used to determine the risk level categorised as *Extreme*, *Very high*, *High*, *Moderate* or *Low* on the FIRM risk matrix for each hazard. The tolerability of the risk is dependent on the risk level. The tolerability guidelines for the various risk levels from the matrix, with the respective required actions, are shown in Table 3.

Table 3: Risk Level Required Actions

Severity	Required Action
Extreme	Do not proceed with any current (controlled) risk in this category without specialist assistance to further treat/reduce risk including the development of contingency plans and / or transference strategies. Only the Board can accept current risk at this level.
Very High	Do not proceed with any treatment option without clear and timely action plans identified to reduce the risk. Only the relevant Group General Manager can accept current risk at this level. The ARMC must be notified of acceptance at the next committee meeting.
High	Remedial action should be identified and implementation commenced with appropriate priority. Only the relevant Group General Manager (or approved delegate) can accept current risk at this level.
Moderate	Management should determine whether further remedial action is required and can be cost effectively implemented. Only the relevant General Manager or their approved delegate can accept current risk at this level.
Low	Management is expected to review the assessment and controls; and, where controls are not satisfactory, remedial action should be identified and implemented, where practical. Action should only be taken in consultation with either Group Risk or Group Audit.

4.2 RISK ASSESSMENT WORKSHOP FORMAT

The workshops involved a multidisciplinary team with considerable knowledge of the mine and independent² experts. The workshop team assessed the likelihood and consequences of the hazards, identified and selected the controls and assessed the adequacy of the controls based on their collective knowledge and experience. The workshop format facilitated the attendees to fully present all hazards within their area of expertise.

In assessing the current risks of the mine operations, the workshops team assumed that the performance of the critical safety and environmental management system elements described within AGL's management systems met the following standards:

- The mine was designed and constructed to the appropriate industry standard at that time.
- The mine is operated by trained and competent operators with existing manning levels however the workshop considered that an operator could make an error in the execution of their duties.
- The equipment is in sound operating condition and is regularly maintained as per scheduled maintenance and inspections activities defined within the maintenance system. However the workshop considered failure of mechanical equipment as a potential cause of a hazard.
- Equipment maintenance is performed by appropriately qualified personnel.
- Equipment and materials procured meet their intended specifications.

4.3 RISK ASSESSMENT APPROACH

The bowtie approach was selected for the risk assessment. This methodology provides the mechanism of linking potential causes to the respective hazards along with the preventative and mitigative controls for each causal pathway. Within this process, identification of controls can be readily documented, together with potential additional controls, where applicable.

² Independent is defined as not an employee of AGL or any of its related bodies corporate as described in "Requirements for Compliance with Risk Management Conditions", Department of Economic Development, Jobs, Transport and Resources.

An example bowtie diagram is shown in Figure 2.

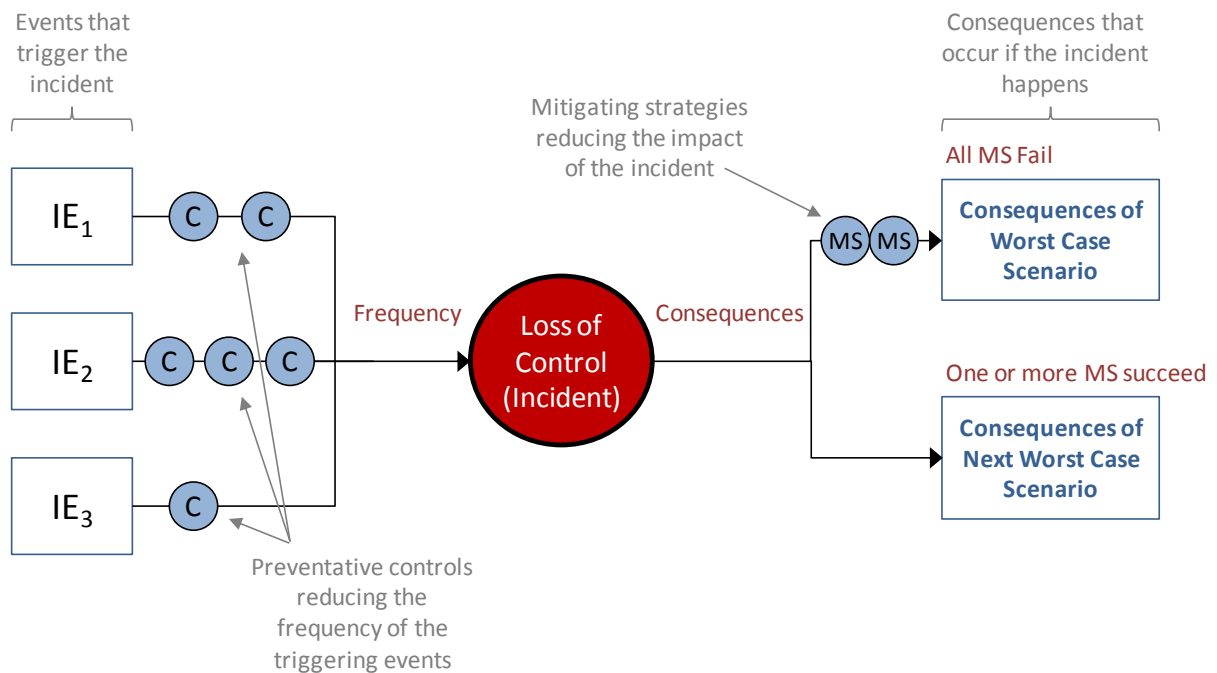


Figure 2: Example Bowtie Diagram

4.4 RECORDING THE HAZID AND RISK ASSESSMENT

The Meercat *Riskview* program was used to record the assessment process. The hazards, causes, outcomes and controls were documented using the software. The software visually represents the information in bowtie diagrams. The bowties are dynamically updated if the underlying risk assessment is revised.

4.5 RISK ASSESSMENT OVERVIEW

This section describes the process undertaken to comply with the risk assessment component of Condition 1A - Risk Management in accordance with the licence amendment. The primary objective of the AGL's Health, Safety & Environmental (HSE) Risk Management system is to establish a mechanism to minimise HSE risks which arise from the operation at the mine.

The risk assessment approach outlined in the AGL procedure *HSE Risk Management Standard Methodology* [6] includes the following main steps:

- Step 1. Identify hazard;
- Step 2. Assess the risk;
- Step 3. Determine controls;
- Step 4. Assign responsibility and timeframes;
- Step 5. Record the findings; and
- Step 6. Review and monitor.

For this assessment, these steps, with exception of steps 4 and 6, were redefined and broadly expanded to align with risk assessment component of Condition 1A – Risk Management. These are described as follows:

- Step 1. Identify hazards and causes that could impact the environment and/or public safety;
- Step 2. Assess the risks arising from those hazards through consideration of their consequences and likelihood

- Step 3. Determine if the hazard can be eliminated, where practicable;
- Step 4. Identify the preventative and mitigative controls;
- Step 5. Assess the effectiveness and adequacy of these controls in preventing or mitigating the risk;
- Step 6. Identify improvement measures to reduce the risks.

Steps 4 and 6 from AGL procedure *HSE Risk Management Standard Methodology* should be addressed in the Management Plan.

4.5.1 Step 1 – HAZID Identification

In identifying hazards that could have the potential impact the environment and/or public safety, aspects for consideration included:

- The types of activities conducted at the mine including hazardous chemicals;
- Consideration of individual events and analysis of common minor occurrences which could combine to cause an impact;
- Previous risk assessments;
- Previous audits and inspections;
- Historical incidents at the mine; and
- Historical incidents at other mining facilities conducting similar operations.

Prior to the workshop, a preliminary list of hazards was developed. This was developed from the hazards and causes from the existing AGL hazard registers [7,8,9,10,11]. The causes were grouped according to the relevant hazard type (e.g. fugitive dust, water contamination, land degradation etc.) and consequence category level to enable simpler review and assessment in the HAZID workshop. Draft bowtie diagrams were developed for each hazard.

A HAZID workshop was scheduled to involve key AGL personnel and independent experts with the appropriate level of experience in the respective area of the assessment. The list that was developed in the pre-work was validated in the HAZID workshop. The workshop then used open brainstorming to identify additional hazards and causes that should be further assessed in the risk assessment step. The output of the HAZID workshop was a listing of potential hazards for the mine with supporting details describing the basis for their classification as an environment and/or public safety hazard (i.e. what the potential consequences could be). Where it was assessed that specific causes could not credibly lead to the hazard and/or where the credible worst-case consequence could not result in a risk to the environment or public safety, these hazards or causes were excluded from further assessment in the risk assessment step. The basis for these decisions was recorded in the HAZID workshop records.

4.5.2 Steps 2, 3, 4, & 5 - Risk Assessment

Following the HAZID workshop, a risk assessment workshop was conducted to assess the hazards and causes identified during the HAZID using the bowtie approach. The existing controls in place to prevent and/or mitigate the hazard were identified by the workshop group. As part of the preparation for the workshop, the controls that were recorded from the existing AGL hazard registers were extracted. These were presented to the workshop group for review and validation. Additional control measures that were identified by the workshop group were added as appropriate. A risk assessment of each hazard, considering the existing controls in place, was conducted utilising the FIRM risk assessment matrix. These steps are described in more detail below.

4.5.2.1 Consequence Assessment

The consequences of each hazard were assessed using the consequence scale on the FIRM risk assessment matrix. In assessing the consequences, the following factors were considered:

- Credible “worst-case” impacts
- Potential receptors of the consequence, i.e. offsite impact on surrounding land and its occupants, and;
- Hazards from mine – related activities that could pose a risk to assets outside the mine lease area, which could have an impact to the environment or public safety.

For instances where the workshop team was unable to qualify the consequences of the hazard, e.g. impact of depletion of the regional aquifers, an action was raised to further define the potential impact of this hazard.

4.5.2.2 Likelihood Assessment

The likelihood of each cause was determined qualitatively using the workshop group’s professional judgement, historical data and other sources, i.e. drawing examples from other similar facilities. The likelihood scale on the FIRM risk matrix as shown in Table 4, was used as a guide. The likelihood assessment assumes that there are no safeguards in place to prevent the hazard. The basis for the likelihood assessment was documented within *Riskview*.

Table 4: AGL FIRM Matrix - Likelihood Rating

Likelihood Descriptor	Definition Used
Almost Certain	Knowledge/evidence either within AGL or externally suggests this event/risk occurs almost all of the time. The occurrence of this risk is common and expected – greater than 1 in 2 chance (greater than 50%). Assumed event frequency: 5×10^{-1} per year.
Likely	Knowledge/evidence either within AGL or externally suggests this event/risk occurs at regular intervals - between 1 in 10 and 1 in 2 chance (10% to 50%). Assumed event frequency: 1×10^{-1} per year.
Possible	Occurs either within AGL or known environment on an irregular basis but frequently enough to be more than a remote possibility – between 1 in 100 and 1 in 10 chance (1% to 10%). Assumed event frequency: 1×10^{-2} per year.
Unlikely	Aware that the event has occurred occasionally either within AGL or externally. However, it is not something that would be classed as a common occurrence and would only occur in certain remote circumstances – between 1 in 10,000 and 1 in 100 (0.01% to 1%). Assumed event frequency: 1×10^{-3} per year.
Rare	Either is not known to have occurred or has not occurred in many ‘exposures’ to the potential risk – greater than 1 in 10,000 (less than 0.01%). Assumed event frequency: 1×10^{-4} per year.

4.5.2.3 Identify Existing Controls and Control Effectiveness

When considering a single hazard, a large number of existing controls may be identified as contributing to the management of risk associated with that hazard. However, the actual contribution of each control to the management of the risk profile may vary widely. Those controls that have the greatest influence in managing the risk associated with hazard were identified as “critical controls”. It is these controls that require subsequent focus to ensure that the risk from the hazards remains at a tolerable level. For this assessment, critical controls have been assigned to:

- Controls used in hazards which have the potential to result in a consequence Level 3 and above for environmental impact and consequence Level 2 and above for public safety impact based on the FIRM risk matrix consequence category and;
- Controls which are considered to be effective in providing significant risk reduction (reduces the likelihood of the hazard occurring and/or significantly mitigates the impacts of the hazard).

The effectiveness of the identified controls in managing the risk associated with the hazards was assessed using a qualitative rating approach. Factors that were considered as part of the controls assessment included the following:

- Implemented:** The control must be fully implemented, i.e. the control must be in place.
- Reliability:** The control should be sufficiently reliable, i.e. it should have a low probability of failure on demand.
- Monitored and Audited :** The control should be monitored so that its performance may be established. Systems that manage the performance of the control should be audited to ensure that the control remains functional and effective.
- Applicability:** The control must be applicable to the cause. If it functions as designed, it should prevent the cause or significantly mitigate its consequences.
- Independence:** There should be sufficient independence of the control nominated for a single cause. There should be no single failure that can disable two or more controls.

In the assessment, the inherent effectiveness of the control was qualitatively assessed, considering the implementation state, reliability level and extent of performance monitoring/auditing. This assessment was represented by allocating an effectiveness rating to each control. In assessing the control effectiveness, four ratings were used:

- Very Good
- Good
- Average
- Assessed.

The maximum level of risk reduction (likelihood reduction) that the control measure is assumed to provide will be dependent on the assigned effectiveness. The control effectiveness ratings assigned will translate to an equivalent likelihood reduction as presented in Table 5.

Table 5: Control Effectiveness – Reduction in Likelihood

Effectiveness Rating	Equivalent Likelihood Reduction
Very Good	2 orders of magnitude (100 x)
Good	1 order of magnitude (10 x)
Average	Less than ½ order of magnitude (~3 x)
Assessed	No risk reduction assigned

Where it was considered that a control may not be able to provide full risk reduction for a specific scenario, or where it was not independent from other controls in the scenario, a reduced applicability factor was applied. This reflects the reduction in effectiveness of the control for that specific scenario. This is described in Table 6.

Table 6: Applicability Factor

Applicability	Reduction in Control Effectiveness
Full	The inherent effectiveness of the control is fully applied to the specific scenario.
Partial	The inherent effectiveness of the control when applied to the specific scenario is reduced by approximately half.
No	The control was not considered to be effective or independent for the specific scenario.

4.5.2.4 Control Adequacy

A qualitative judgement was made by the workshop as to the overall adequacy of the controls for each hazard. Adequacy was assessed based on the following:

The future risk with the controls considered in place.

The risk level is compared with the risk tolerability criteria. The level of risk determines the amount of time, trouble and effort that would be expected to further reduce the risk. The greater the risk, the greater the effort expected.

The number of controls that were selected.

A number of different and independent controls are more acceptable than reliance upon a few.

The hierarchy, independence and effectiveness of controls selected.

A mixture of different types of controls, such as engineering, administrative, and procedural controls is preferred to reliance upon a single type of control. Also, there is a preference for controls that eliminate or prevent hazards, rather than those that reduce or mitigate the impacts of the hazard (though these are still necessary).

4.5.2.5 Probability Modifiers

In assessing the risks of the hazards, probability modifiers were used to account for the likelihood that the cause would result in the assigned consequence or as a cause contribution adjustment. The following probability modifiers were considered:

- Probability of a cause escalating to the hazard and subsequent consequence, e.g.:
 - An initial fire escalating to a significant fire within or near the mine lease area.
 - Ground movement escalating to the specified impact on the environment
- Cause contribution adjustment to account for cases where only a single causal pathway could result in the consequence, to prevent over-estimation of the risk.

Probabilities were assigned using the expertise and judgement of the workshop team. Probabilities were aligned with the likelihood scale of the AGL risk matrix using an order of magnitude approach as presented in Table 7.

Table 7: Probability Modifiers

Probability Assessment	Probability
Almost certain	100%
Likely	10%
Possible	1%
Unlikely	0.1%
Rare	0.01%

4.5.2.6 Risk Assessment

The likelihood rating for each consequence was determined from the estimated cause likelihoods with further likelihood reduction (due to the controls in place) and probability modifiers, where applicable. The calculation is performed in the *Riskview* software. The resulting risk level for each hazard was determined by combining the consequence rating with the estimated likelihood rating using the FIRM risk assessment matrix as shown in Figure 3. The risks were categorised as *Extreme, Very high, High, Moderate or Low*. The team then considered that the risk of a hazard was only tolerable if the risk was classified as a “*Moderate*” or “*High*” and that reasonably practical actions had been defined.

AGL's risk matrix is generally not aligned to DEDJTR's³ Resource Rights Allocation and Management (RRAM) risk criteria [12]. However, as AGL sets lower thresholds for consequence impacts and risk criteria, the overall risk rating derived from the assessment can be considered to be more conservative than if DEDJTRs risk criteria had been applied directly.

³ Approval was provided by DEDJTR for AGL to utilise the FIRM risk matrix for this assessment

L i k e l i h o o d	Almost Certain (5)	2.5 Moderate	5 High	7.5 High	20 Extreme	25 Extreme
	Likely (4)	2 Moderate	4 Moderate	6 High	16 Very High	20 Extreme
	Possible (3)	1.5 Low	3 Moderate	4.5 High	12 Very High	15 Very High
	Unlikely (2)	1 Low	2 Moderate	3 Moderate	8 High	10 Very High
	Rare (1)	0.5 Low	1 Low	1.5 Low	4 Moderate	5 High
		Level 1 (0.5)	Level 2 (1.0)	Level 3 (1.5)	Level 4 (4)	Level 5 (5)
		Consequence				

Figure 3: AGL FIRM Risk Assessment Matrix

4.5.3 Step 6 - Risk Reduction

In determining what is “reasonably practicable”, the following questions were posed to the workshop team for each hazard:

- Can the causes or the hazard be eliminated?
- Are opportunities for risk reduction available
- Are the risks tolerable for a hazard?
- What gaps exist in the existing controls?
- Can any additional or alternative controls be justified?

During the workshop, these questions prompted the team to consider further improvements, where possible. Recommendations were recorded where there was an opportunity to further improve the performance of existing controls. Additional “proposed” controls were also identified during the workshop where this was considered to be practicable using the “hierarchy of controls” concept (i.e. elimination, substitution, prevention, mitigation). In addition, all relevant codes, standards and industry good practice for each hazard were considered and applied, where relevant.

Where reasonably practical improvements were identified as a result of the review of control measure effectiveness, these were included as recommendations.

5 RESULTS AND DISCUSSION

5.1 HAZID AND RISK ASSESSMENT WORKSHOP ATTENDEES

The HAZID and risk assessment workshop was conducted on the 12 - 14 October 2015 and 16 October 2015. The personnel involved in the workshop are presented in Table 8, with the attendance sheets provided in Appendix A. The experience and qualification of the personnel and independent experts involved are provided in Appendix B.

Table 8: HAZID and Risk Assessment Workshop Attendees⁴

Name	Company	Position	Hazard Reviewed															
			Impact to water (Level 1/2)	Impact to water (Level 3)	Impact to water (Level 4/5)	Impact to regional aquifers	Impact to land (Level 1/2)	Impact to land (Level 3)	Impact to land (Level 4/5)	Fugitive dust emissions	Noise emissions	Visual light emissions	Post rehabilitation /fire	Hazardous chemicals	Mine fire	Gas pipelines fire/explosion	Criminal act	
Debbie Nay	AGL	Environmental Advisor	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-
Barry Cook	GHD	Independent Expert - Meteorologist	-	-	-	-	-	-	-	-	●	●	-	-	-	-	-	-
Jason Shields	AGL	MSS – Site Manager	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	-
Jon Missen	AGL	Environment & Earth Sciences Superintendent	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Matthew Anderson	TP6	Independent Expert - Business Resilience Specialist	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●
Nick Demetrios	AGL	Head of Security & Emergency Management	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●
Paul Barrand	AGL	Infrastructure, Civil, Environmental Manager	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rohan Bett	AGL	Civil Engineer – Fire Services	-	-	-	-	-	-	-	-	-	-	-	-	-	●	●	-
Ron Keith	MSS	Independent Fire Expert	-	-	-	-	-	-	-	-	-	-	-	-	-	●	●	-
Slavko Kacavenda	GHD	Independent Expert - Principal Geotechnical Engineer	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-
Wajahat Bajwa	GHD	Independent Expert - Principal Environmental Engineer	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-

⁴ ● Denotes attendee is present for the hazard reviewed.

Name	Company	Position	Hazard Reviewed														
			Impact to water (Level 1\2)	Impact to water (Level 3)	Impact to water (Level 4\5)	Impact to regional aquifers	Impact to land (Level 1\2)	Impact to land (Level 3)	Impact to land (Level 4\5)	Fugitive dust emissions	Noise emissions	Visual light emissions	Post rehabilitation /fire	Hazardous chemicals	Mine fire	Gas pipelines fire/explosion	Criminal act
Elio Stocco	R4Risk	Facilitator	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Flora Chung	R4Risk	Technical Secretary	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

5.2 HAZID SUMMARY

The HAZID workshop identified fifteen credible hazards with the potential to pose a risk to the environment and or public safety. The summary of the identified hazards are presented in Table 9.

Table 9: HAZID Summary

Hazard ID.	Hazard	Hazard Description
RR-R-00061	Impact to water (Level 1/2)	Mining operations which could cause Level 1/2 impact to the environment (water).
RR-R-00062	Impact to water (Level 3)	Mining operations which could cause Level 3 impact to the environment (water).
RR-R-00063	Impact to water (Level 4)	Mining operations which could cause Level 4 impact to the environment (water)
RR-R-00064	Impact to regional aquifers	Sustained changes to the aquifer properties or structures which may impact future users or sensitive receptors.
RR-R-00065	Impact to land (Level 1/2)	Mining operations which could cause consequence Level 1/2 impact to the environment (ground movement/land degradation).
RR-R-00066	Impact to Land (Level 3)	Mining operations which could cause Level 3 impact to the environment (ground movement/land degradation) and or public safety.
RR-R-00067	Impact to Land (Level 4/5)	Mining operations which could cause Level 4/5 impact to the environment (ground movement/land degradation) and or public safety.
RR-R-00068	Fugitive dust emissions	Mining operations generating fugitive dust emissions which may impact public safety and or loss of amenity/nuisance.
RR-R-00069	Noise emissions	Mining operations generating noise which could cause nuisance or loss of amenity.
RR-R-00070	Visual light emissions	Mining operations generating light emissions which could cause nuisance or loss of amenity.
RR-R-00071	Post rehabilitation/fire	Post closure of mine future hazards which could impact the environment or public safety.
RR-R-00072	Hazardous chemicals	Loss of containment of chemicals which could impact the environment.
RR-R-00073	Mine fire	Significant fire within/near the Mine lease area which may impact public safety and the environment.
RR-R-00074	Gas pipelines fire/explosion	Loss of containment from LP and HP natural gas pipelines.
RR-R-00075	Criminal act	Criminal act which may impact public safety and/or the environment

5.3 RISK ASSESSMENT SUMMARY

The risk assessment reviewed the fifteen hazards identified from the HAZID workshop. A summary of the risk assessment summary is presented in Table 10.

Bowtie diagrams were prepared for each hazard. These show the relationship between the hazards/causes, consequences/impacts and the controls that prevent or mitigate the hazard. The bowtie diagrams also show the likelihood for each cause and the risk reduction assigned to preventative and mitigative controls. These are presented in Appendix C. A total of 43 critical controls were identified that prevent and or mitigate the hazards. A total of 27 recommendations were raised to further reduce the risk of the hazard. The complete list of critical controls and risk reduction recommendations are presented in Appendix D and Appendix E respectively. .

During the risk assessment workshop, a number of causes of potential hazards were subsequently rejected by the workshop team where it was assessed that specific causes could not credibly lead to the

hazard and/or where the credible worst-case consequence could not result in a risk to the environment or public safety. The justification for rejecting these causes is documented in the risk assessment. Details of the rejected causes are provided in Appendix F.

The detailed report containing all the data and assumptions underlying the risk assessment is attached in Appendix G. Information included in this report includes comments that were captured in the workshop that relate to:

- The likelihood assessment for each cause;
- The existing controls for each cause;
- The adequacy assessment for each control, i.e. overall effectiveness as a function of effectiveness and applicability;
- Recommended additional controls or recommendation to improve existing controls;
- The rejected causes and reasoning for rejecting the causes;
- Consequence impacts for each outcome including potential receptors; and
- The risk of each impact.

The recommendations raised in the workshop should be assessed for criticality, practicality and effectiveness to be carried forward to close-out as addressed in the Management Plan.

Table 10: Risk Assessment Output

Hazard Description	Item No.	Consequence Category	Impact Description	Consequence Rating	Current Risk	Future Risk
Impact to water (Level 1/2)	1.	Environment & Community	Contaminated water discharge with the potential to impact the environment.	Level 2	Moderate	Moderate
Impact to water (Level 3)	2.	Environment & Community	Contaminated water discharge with the potential to impact the environment.	Level 3	Low	Low
	3.		Loss in biodiversity: vegetation, habitat destruction, threatened species.	Level 3	Low	Low
	4.		Loss of water usage downstream	Level 3	Low	Low
Impact to water (Level 4)	5.	Environment & Community	Contaminated water discharge with the potential to impact the environment.	Level 4	Moderate	Moderate
	6.		Change in creek grade with the potential to impact the environment	Level 4	Moderate	High
Impact to regional aquifers	7.	Environment & Community	Damage to regional aquifers	Level 3	Moderate	Moderate
Impact to land (Level 1/2)	8.	Environment & Community	Ground movement / land degradation with the potential to impact the environment.	Level 1	Moderate	Moderate
Impact to land (Level 3)	9.	Environment & Community	Ground movement / land degradation with the potential to impact the environment.	Level 3	Low	Low
	10.		Ground movement / land degradation with the potential to impact public safety.	Level 3	Low	Low
Impact to land (Level 4/5)	11.	Environment & Community	Ground movement / land degradation with the potential to impact public safety	Level 4	Moderate	High
	12.		Settling Pond dam wall failure induced flood event with the potential to impact public safety.	Level 5	High	High
	13.	Public Safety	Land subsidence with the potential to impact the environment	Level 4	Moderate	High
Fugitive dust emissions	14.	Public Safety	Fugitive dust emissions with the potential to impact public safety.	Level 2	Moderate	Moderate
	15.	Environment & Community	Loss of amenities due to fugitive dust emissions (visual/nuisance).	Level 3	Moderate	Moderate
Noise emissions	16.	Environment & Community	Noise emissions with the potential to result in nuisance or loss of amenity to the local community.	Level 3	Moderate	Moderate
Visual light emissions	17.	Environment & Community	Visual light emissions with the potential to result in nuisance or loss of amenity.	Level 1	Low	Low

Hazard Description	Item No.	Consequence Category	Impact Description	Consequence Rating	Current Risk	Future Risk
Post rehabilitation/fire	18.	Public Safety	Fire risk with the potential to impact public safety.	Level 5	N/A	High
	19.	Environment & Community	Environmental impacts from unsuccessful rehabilitation - Land, Aquifer and Surface Water.	Level 3	N/A	Moderate
	20.		Smoke risk with the potential to impact the public safety	Level 5	N/A	High
	21.		Environmental risk from smoke with the potential to impact public amenities.	Level 3	N/A	Low
Hazardous chemicals	22.	Environment & Community	Contaminated water discharge with the potential to impact the environment.	Level 3	Moderate	Moderate
	23.		Contaminated land with the potential to impact the environment	Level 2	Moderate	Moderate
Mine fire	24.	Public Safety	Fire risk with the potential to impact public safety.	Level 5	High	High
	25.		Smoke risk with the potential to impact the public safety	Level 5	High	High
	26.	Environment & Community	Environmental risk from smoke with the potential to impact public amenities.	Level 3	Low	Low
Gas pipelines fire/explosion	27.	Public Safety	Natural gas pipeline leak and associated fire/explosion with the potential to impact public safety	Level 5	High	High
Criminal act	28.	Environment & Community	Criminal related hazard with the potential to impact the environment.	Level 3	Low	Low
	29.	Public Safety	Criminal related hazard with the potential to impact the public safety.	Level 5	High	High

5.3.1 High Risk Hazards

The risk assessment has identified a total of 10 *High* risks of which may remain into the future irrespective of the implementation of recommendations. Table 11 provides commentary on each *High* risk item as identified in Table 10.

Table 11: Mine High Risk Hazards

Item No.	Hazard Description	Impact Description	Description
6	Impact to water (Level 4)	Change in creek grade with the potential to impact the environment.	The future development associated with the planned Traralgon Bypass is expected to impact the surface water and mine stability. This development as currently proposed presents a potential <i>High</i> risk into the future. This cause is the major risk contributor for each of these impacts. Recommendation RR-A-00054 has been included in the assessment to address this. Successful mitigation of the risks associated with the Traralgon Bypass can potentially reduce these risks to <i>Moderate</i> .
11	Impact to land (Level 4/5)	Ground movement / land degradation with the potential to impact public safety.	
13	Impact to land (Level 4/5)	Ground movement / land degradation with the potential to impact the environment	
6	Impact to water (Level 4)	Change in creek grade with the potential to impact the environment.	Recommendations RR-A-00005, 19 and 20 have been raised to further reduce the risk of this hazard.
11	Impact to land (Level 4/5)	Ground movement / land degradation with the potential to impact public safety.	Recommendation RR-A-00005 has been raised to further reduce the risk of this hazard.
12	Impact to land (Level 4/5)	Settling Pond dam wall failure induced flood event with the potential to impact public safety.	The current and future risks are both considered <i>High</i> as a consequence category Level 5 has been assigned due to the potentially very serious consequences of the hazard. The likelihood in this event is at the lowest limit of the likelihood scale on the FIRM risk matrix. Recommendations RR-A-00024 has been raised to further reduce the risk of this hazard.
18	Post rehabilitation/fire	Fire risk with the potential to impact public safety.	The future risk is considered <i>High</i> as a consequence category Level 5 has been assigned due to the potentially very serious consequences of the hazard. The likelihood in this event is at the lowest limit of the likelihood scale on the FIRM risk matrix. Recommendations RR-A-00036 and 57 have been raised to further reduce the risk of this hazard
20		Smoke risk with the potential to impact the public safety	
24	Mine fire	Fire risk with the potential to impact public safety.	The current and future risks are both considered <i>High</i> as a consequence category Level 5 has been assigned due to the potentially very serious consequences of the hazard. The likelihood in this event is at the lowest limit of the likelihood scale on the FIRM risk matrix. Recommendations RR-A-00005, 16, 33, 46, 50, 51 and 55 have been raised to further reduce the risk of this hazard
25		Smoke risk with the potential to impact the public safety	

Item No.	Hazard Description	Impact Description	Description
27	Gas pipelines fire/explosion	Natural gas pipeline leak and associated fire/explosion with the potential to impact public safety	The current and future risks are both considered <i>High</i> as a consequence category Level 5 has been assigned due to the potentially very serious consequences of the hazard. The likelihood in this event is at the lowest limit of the likelihood scale on the FIRM risk matrix. No additional practical recommendations were identified.
29	Criminal act	Criminal related hazard with the potential to impact the public safety.	The current and future risks are both considered <i>High</i> as a consequence category Level 5 has been assigned due to the potentially very serious consequences of the hazard. The likelihood in this event is at the lowest limit of the likelihood scale on the FIRM risk matrix. No additional practical recommendations were identified.

5.4 RISK ASSESSMENT FOLLOW-UP WORK

The risk assessment represents a snapshot of the environmental and public safety hazards and risks at the mine at the time of the study. To ensure that risks are addressed and appropriately managed, AGL should address the following activities in the Management Plan:

- Assess each recommendation for criticality, practicality and effectiveness and carry them forward to close-out
- Implement a program to periodically update the risk assessment throughout the life cycle of the mine. This is to ensure that the assessment continually reflects these environmental and public safety hazards and risks at the mine
- Develop performance criteria for critical controls identified in the assessment by:
 - Establishing links between the controls and the mine's management system such that the adequacy with which the system manages these controls can then be assessed during future audits.
 - Defining performance standards and indicators for the controls such that the reliability of the controls assumed in the risk assessment continues to remain valid.

6 CONCLUSION

The HAZID identified fifteen credible hazards with the potential to pose a risk to the environment and or public safety. The risk assessment identified a total of ten *High* risks of which may remain into the future irrespective of the implementation of recommendations. A total of 43 critical controls were identified that prevent and or mitigate the hazards and 27 recommendations were raised to further reduce the risk of the hazards.

The HAZID and risk assessment process conducted meets the requirements of the risk assessment component within Condition 1A – Risk Management as follows:

- The assessment process adopted incorporated reviews of incidents, past studies, and other documentation to provide knowledge about potential risks to the environment and public safety from activities within the mine lease area. This ensured that all the hazards and causes and the potential impacts to the environment and or public safety were properly identified.
- The likelihood and consequence of each hazard/cause was assessed, and the resulting risks were assessed using AGLs corporate risk criteria via the FIRM risk matrix.
- Where it was considered reasonably practicable to implement additional or alternative controls to further reduce the risks, recommendations were raised to investigate these options. This included hazards where the likelihood assessment of the consequence is already at the lowest scale on the FIRM risk matrix.
- The bowtie diagrams allowed identification and prioritisation of potentially high risk hazards and clearly identifies the controls that manage the risks of those hazards.
- The assessment considered the effectiveness and adequacy of the controls, and identified the critical controls for each hazard.
- The involvement of knowledgeable and experienced personnel (independent experts and AGL staff) provided knowledge of additional potential hazards, associated consequences and considered the suitability and availability of controls.

7 REFERENCES

- 1 AGL Loy Yang Mining Licence No. 5189, Document No. RPT000013, Rev 01, 24/02/2015
- 2 AGL, "AGL Risk Management & Assessment Framework", June 2014.
- 3 AGL Loy Yang, "Loy Yang Mining Licence 5181 Work Plan".
- 4 AGL Loy Yang Work Plan Variation – Mining Licence 5189, "Introduction – Background", 19 October 2015.
- 5 AGL Loy Yang Mining Licence Work Plan Variation, "Figure 2 - Regional Plan", Job No. 31-2072315, Rev 5, 25 September 2015.
- 6 AGL Loy Yang, "Health, Safety & Environment Risk Management Standard Methodology", Doc No. AGL-HSE-SDM-004.1, Version 1.0, 25 November 2014.
- 7 AGL Loy Yang Hazard Register, "FY15 Aspects and Impacts Register".
- 8 AGL Loy Yang Hazard Register, "Geotechnical Hazard Risk Register_v2", 13 February 2015.
- 9 AGL Loy Yang Hazard Register, "LY Enviro Consequence Risks", 18 May 2015.
- 10 AGL Loy Yang Hazard Register, "FIRM Risk Register", 29 June 2015.
- 11 AGL Loy Yang Hard Register, "Major Fire", 29 June 2015
- 12 Figure 10 – RRAM Risk Criteria, DEDJTR Risk Assessment and Management Plan 2015-06-30

APPENDIX A – WORKSHOP ATTENDANCE LIST

This appendix lists the workshop attendees that participated during the risk assessment process.

Representatives from the government authorities of DEDJTR, EPA and CFA were invited to participate in the HAZID and risk assessment process as observers of the workshop proceedings, these invitations were declined by the representatives from these departments.

ATTENDANCE SHEET

Project : 116-10 AGL Loy Yang Mine Licence Risk Assessment

Dates : Hazard Identification & Risk Assessment:

12 – 14 October 2015

Name	Title	Company	Mon 12/10	Tue 13/10	Wed 14/10		
Debbie Nay	Env. Advisor	AGL	Oray	Oray			
Wajir Bajwa	GHD Principal Eng	GHD					
Stavros Karavenda	Principal Eng Geotech	GHD					
Don Meehan	EVES SUPT	AGL LM					
Pam Barron	ICE MANAGER	AGL					
WAJAHAT BAJWA	Principal Eng	GHD					
Stavros Karavenda	Principal Geotech Eng	GHD					
BARRY COOK	METEOROLOGIST	GHD.					
RON KEITH	FIRE EXPERT	MSS.					ronkeith@bigpond.com.
JASON SMELDS	EMERGENCY RESPONSE EXPERT	MSS					
ROHAN BETT	CIVIL ENGINEER - FIRE SPECIALIST	AGL					
* Matthew Anderson	Business Resilience	AGL TP 6					
Nick Demetrios	Specialist						
	Head of Security & Emergency Management	AGL					
Elio Stocco	Facilitator	R4Risk	ES	ES	ES		
Flora Chung	Scribe	R4Risk					

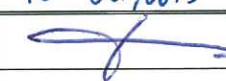

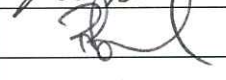
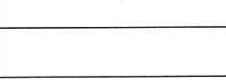
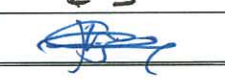
- * Participation via teleconference and shared screen
- * Rehabilitation and hazardous chemicals

ATTENDANCE SHEET

Project : 116-10 AGL Loy Yang Mine Licence Risk Assessment

Dates : Hazard Identification & Risk Assessment:

16 October 2015

Name	Title	Company	16 th Oct, 2015		
REN KEITH	FIRE SME	MSS			
JON MIESSEN	EVES SUPT	AGL LM			
ROHAN BETT	CIVIL ENGINEER - FIRE SERVICE	AGL			
PAUL BALLARD	ICE MANAGER	AGL			
Elio Stocco	Facilitator	R4Risk	ES		
Flora Chung	Scribe	R4Risk			

APPENDIX B – WORKSHOP PERSONNEL EXPERIENCE

The risk assessment workshop was attended by representatives from AGL who had the appropriate knowledge and expertise and the independent¹ experts². This appendix list the experience and qualifications of the attendees.

B.1. AGL REPRESENTATIVES

Name:	Debbie Nay
Role:	Environmental Advisor
Qualification:	Bachelor of Science (Hons) – Monash University Honours Thesis on Loy Yang Ash Pond Groundwater Quality 2006
Brief Description	
Debbie Nay has extensive experience in environmental management in relation to the mine operations. She has worked at GHD for 10 years in the Contamination Assessment and Remediation team undertaking Phase 1 site assessments, soil and groundwater assessments for audits, waste classification and project management on a number of industrial and commercial sites. She commenced working at AGL Loy Yang in 2013 undertaking tasks including licence compliance, environmental improvement plans, environmental risk assessment, community consultation, incidents investigations and audits.	

Name:	Jason Shields
Role:	Emergency Response and Security Representative
Qualification:	Incident Controllers Course (2014) – Australian School of Emergency Management (ASEM) Certificate III in Public Safety - Fire Fighting Operations (2007) Certificate II in Assessment Maintenance (2005) Australian Inter -Service Incident Management System (2008)
Brief Description	
Jason has more than 20 years of experience in emergency and protective services. He has vast experience in developing, coordinating and directing emergency exercises within the power and mining industry. Jason is responsible for Energy Australia's fire prevention, detection and suppression systems which involved tendering and contract management of the service(s). He is also responsible for the review and update of the Emergency Response and Management Plans at Energy Australia and AGL Loy Yang.	

Name:	Jon Missen
Role:	Environment Representative - Environment & Earth Sciences Superintendent
Qualification:	Certificate of Technology (Associate Diploma) – Civil Engineering Graduate Certificate of Management
Brief Description	
Jon has more than 30 years of experience in mine planning and operations, civil engineering, geotechnical engineering and environmental management at the Latrobe Valley brown coal mine. He is currently the Environment and Earth Sciences Superintendent at AGL Loy Yang mine. He is responsible for geotechnical and hydrogeological management, mine rehabilitation, land and environmental management.	

¹ Independent is defined as not an employee of AGL or any of its related bodies corporate as per Licence Condition - 1A.3 in the Attachment 2 of AGL Mine License No. 5189.

² Expert is defined as those who have the appropriate expertise in their representative field as per Licence Condition - 1A.3 in the Attachment 2 of AGL Mine License No. 5189

Name:	Paul Barrand
Role:	Mine Representative – Infrastructure, Civil and Environmental Manager
Qualification:	Bachelor of Mining Engineering Post graduate in Business Management – Melbourne Business School Member of Australasian Institute of Mining and Metallurgy
Brief Description	
<p>Paul Barrand has extensive experience in mining and geotechnical engineering, risk management and Occupational Health and Safety. His career encompasses working for Marsh, BHP Billiton, Newcrest and AGL, in and managing open cut gold, coal (both thermal and metalliferous) and iron ore mines. Since 2012, Paul has been appointed as the Infrastructure, Civil and Environmental Manager for AGL Loy Yang. His role manages primarily the mine infrastructure, earth sciences and mine rehabilitation at AGL Loy Yang.</p>	

Name:	Rohan Bett
Role:	Emergency Response and Fire Representative
Qualification:	Bachelor of Interdisciplinary Engineering (Civil) – Monash University Level 2 Incident Controller - AIMS
Brief Description	
<p>Rohan has more than 10 years of experience in design and project management of water, wastewater and fire service infrastructure. He was previously employed as a Civil Engineer with GHD and was seconded to Hazelwood Mine to assist post the mine fire. Rohan has extensive experience in fire prevention, mitigation and suppression systems. His relevant experience includes project managing the design and construction of the fire service and dewatering projects at the Hazelwood mine post the mine fire incident. Rohan is employed as the Fire Service and Dewatering Engineer at Loy Yang Mine since 2011. He is an active volunteer member of the CFA for more than 18 years.</p>	

Name:	Nick Demetrios
Role:	Emergency Response and Security Representative
Brief Description	
<p>Nick has extensive experience in the Power Industry in the Latrobe Valley. He specialises in security and emergency management. He is currently the Head of Security & Emergency Management. His role includes the oversight of the security and emergency services arrangements for the operating sites at AGL. Nick also represents AGL in regional fire and emergency response forums.</p>	

Name:	Slavko Kacavenda
Role:	Geotechnical Engineering Independent Expert
Qualification:	Bachelor of Engineering with Honours - Monash University
Brief Description	
<p>Slavko has over thirty years of experience in application of geotechnical engineering to mining, civil infrastructure and other projects. He has extensive experience with the brown coal based electricity industry in the Latrobe Valley. Slavko main areas of expertise include organisation and supervision of ground investigations, assessment of soil parameters, stability analyses of natural and man-made slopes, mine and overburden dump batter design, geotechnical instrumentation, earth fill specifications and quality control and land subsidence modelling. Through his extensive expertise and exposure to technical mining advances he has developed a thorough understanding of the geotechnical issues with these mines.</p>	

Name:	Wajahat Bajwa
Role:	Environmental Engineering Independent Expert
Qualification:	Bachelor of Science (Civil Engineering) - Lahore, Pakistan; Postgraduate Diploma (Sanitary Engineering), Institute of Hydraulic & Environmental Engineering, Delft, The Netherlands,; Postgraduate Diploma (Computer Science), Victoria University of Technology, Melbourne, Australia.
Brief Description	
<p>Wajahat Bajwa is a Principal Environmental Engineer at GHD. He is an EPA Victoria appointed auditor for industrial facilities. His roles have involved legislative compliance, research and development, operational management, risk assessment and project management. Wajahat has extensive experience in environmental related risk assessment and has had considerable experience in dealing with landfills and wastewater management facilities, including the Victorian Desalination Plant, Long Term Contaminant Facility at Cranbourne and many other landfills. Prior to joining GHD, Wajahat was the Manager of the Yarra Region within EPA Victoria. In this position, he was responsible for the overall strategy and direction in managing/regulating a large number of waste management, storage and treatment facilities.</p>	

Name:	Elio Stocco
Role:	Risk Assessment Independent Expert
Qualification:	Bachelor of Engineering (Chemical) – Royal Melbourne Institute of Technology. Chartered Chemical Engineer Chartered Member, Institution of Chemical Engineers. Registered Professional Engineer – Queensland.
Brief Description	
<p>Elio Stocco is a chemical engineer with 24 years of experience in operations and risk management, of which he has worked for ten years as a Principal Risk Consultant. He has extensive experience in all methods of risk assessment across various industries and is a trained facilitator. His main areas of expertise include quantitative / qualitative risk assessments, layers of protection analysis, safety case development, HAZOP, HAZID and SIL analysis, occupied buildings risk assessments, emergency response planning, fire safety studies and consequence modelling. Elio has an intimate knowledge of the Major Hazard Facilities regulatory regimes in particularly those that relate to safety assessments.</p>	

Name:	Flora Chung
Role:	Support to Risk Assessment Independent Expert
Qualification:	Bachelor of Engineering (Chemical and Biomolecular) with Honours – University of Melbourne.
Brief Description	
<p>Flora Chung is a chemical engineer with over four years of experience in process safety and risk management. She has extensive experience in various methods of risk assessment across various industries. Flora's relevant experience includes facilitating and scribing risk assessment workshops and assisting in the development of safety management systems for various clients.</p>	

APPENDIX C – BOWTIES

This appendix list the bowtie diagrams developed during the risk assessment process. The bowtie diagrams graphically displays the link between causes, hazards and the preventative and mitigative controls for each causal pathway. The current and future risk for each hazard is also shown.



Causes	Preventative Controls
<p>→ Contaminated water runoff from the OB dump due to excessive rainfall [Rare (1)]</p>	<p>→ Containment of mine drainage within the Mine Lease Area (Containment of mine drainage (retention ponds) within the Mine Lease Area) [Good]</p> <p>→ Water Management Plan (Water Treatment System) [Good]</p>
<p>→ Contamination of surface discharge due to failure of oil separation system [Possible (3)]</p>	<p>→ Settling Pond Oil in Drain (Main drainage oil detection, alarm and operator response (prior to settling pond)) [Good]</p> <p>→ Containment of mine drainage within the Mine Lease Area (Oil containment booms on settling pond) [Good]</p>
<p>→ Generation of acid mine water runoff from exposed large areas of interseam in open cut and internal OB dump [Possible (3)]</p>	<p>→ Operating procedure - lime addition (Operating procedure to adjust pH) [Assessed]</p> <p>→ Containment of mine drainage within the Mine Lease Area (Containment of mine drainage (based in the mine) within the Mine Lease Area) [Good]</p>
<p>→ Contaminated water from Latrobe City Council new landfill site leachate dam discharged onto AGL property [Rare (1)]</p>	
<p>→ PCB spill from transformers [Unlikely (2)]</p>	<p>→ Transformer Maintenance Program (Oil sampling on transformers scheduled through Asset Suite Annual based on condition of equipment) [Good]</p> <p>→ PCB Register allows tracking of spill/leak from transformer (PCB Register allows tracking of a spill/leak from transformer) [Average]</p>
<p>→ Contaminated water from Latrobe City Council old landfill site leachate dam discharged onto AGL property [Possible (3)]</p>	<p>→ Land Management Lease Agreements (Land management and monitoring requirements described in the lease agreement) [Assessed]</p>

Risk Scenario Bowtie

Code

RR-R-00061

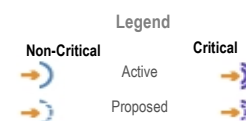
Scenario

Mining operations which could cause Level 1/2 impact to the environment (water)

Event

Impact to water (Level 1/2)

Mitigative Controls	Consequences
<p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p> <p>→ Weekly sampling at discharge point L171 and L160 (Independent third party sampling) [Assessed]</p> <p>→ Monitoring equipment L171, alarm and operator response (Alarm and operator response) [Good]</p>	<p>→ Contaminated water discharge with the potential to impact the environment [Environment & Community]</p> <p>Current Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community. / Possible (3)</p> <p>Proposed Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community. / Possible (3)</p>
	<div style="background-color: #d4af37; padding: 2px; display: inline-block;">Moderate</div>
	<div style="background-color: #d4af37; padding: 2px; display: inline-block;">Moderate</div>





Causes	Preventative Controls
<p>→ Contaminated water due to a failure of Dredge Ash holding cell [Unlikely (2)]</p>	<p>→ Ash Trial Environmental Improvement Plan (EPA Approval process) [Assessed]</p> <p>→ Operational Monitoring Program for the dredging activity (Observational inspection and water balance) [Good]</p> <p>→ Groundwater Monitoring Plan [Average]</p> <p>→ Dam monitoring program (Ash void monitoring program) [Good]</p>
<p>→ Disruption of flow to Sheepwash Creek due to failure of retention basin [Rare (1)]</p>	<p>→ Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management. [Assessed]</p>
<p>→ Settling Pond wall failure due to ground movement as a result of mining activities [Unlikely (2)]</p>	<p>→ Emergency Management Plan and TARPs [Good]</p> <p>→ Inspection, monitoring and maintenance of the Settling Pond [Good]</p>
<p>→ Contaminated water discharge (quality & quantity) due to site based activities [Unlikely (2)]</p>	<p>→ Water Management Plan (Water Treatment System) [Good]</p> <p>→ Containment of mine drainage within the Mine Lease Area (Containment of mine drainage (retention ponds) within the Mine Lease Area) [Good]</p>

Risk Scenario Bowtie

Code

RR-R-00062

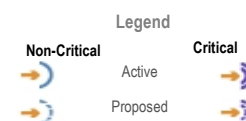
Scenario

Mining operations which could cause Level 3 impact to the environment (water)

Event

Impact to water (Level 3)

Mitigative Controls	Consequences
<p>→ Weekly sampling at discharge point L171 and L160 (Independent third party sampling) [Assessed]</p> <p>→ Monitoring equipment L171, alarm and operator response (Alarm and operator response) [Good]</p>	<p>→ Contaminated water discharge with the potential to impact the environment [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1)</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1)</p> <p style="text-align: right;">Low</p>
<p>→ Monitoring equipment L171, alarm and operator response (Alarm and operator response) [Good]</p> <p>→ Weekly sampling at discharge point L171 and L160 (Independent third party sampling) [Assessed]</p>	<p>→ Loss in biodiversity: vegetation, habitat destruction, threatened species [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1)</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1)</p> <p style="text-align: right;">Low</p>
<p>→ Monitoring equipment L171, alarm and operator response (Alarm and operator response) [Good]</p> <p>→ P000081 Community Engagement Plan (Community Engagement Plan) [Average]</p> <p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p>	<p>→ Loss of water usage downstream [Public Safety]</p> <p>Current Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours) / Rare (1)</p> <p>Proposed Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours) / Rare (1)</p> <p style="text-align: right;">Low</p>





Causes	Preventative Controls
<p>→ Acid mine drainage from the overburden dump impacting Traralgon Creek water quality [Unlikely (2)]</p>	<ul style="list-style-type: none"> → Water Management Plan (Water Treatment System) [Good] → Environmental site plan (Ongoing Rehabilitation and Seepage Program) [Average] → Hydrological model for the overburden dump runoff [Average]
<p>→ Change in creek bed grade and flood plains due to land subsidence as a ground failure [Possible (3)]</p>	<ul style="list-style-type: none"> → CPW001M Ground Control Management Plan (Subsidence modelling and monitoring) [Good] → LV Regional Groundwater Management Plan (Regional coordination modelling and monitoring of subsidence) [Good] → Aquifer Depressurisation Annual Report (Optimisation of groundwater extraction to minimise subsidence effects) [Good] → LV Regional Groundwater Management Plan (Regional and third party monitoring (every 5 years) reported to DEDJTR and Southern Rural Water) [Good] → Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain. [Good]
<p>→ Planned Traralgon Bypass and associated development to impact surface water and mine stability [Rare (1)]</p>	<ul style="list-style-type: none"> → AGL to engage with the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed. [Assessed]
<p>→ Subsidence due to coal block sliding impacting Traralgon Creek. [Likely (4)]</p>	<ul style="list-style-type: none"> → Geotechnical Inspections and TARPS [Good] → Surface drainage inspection and maintenance [Good] → Subsurface (horizontal drains) drainage inspection and maintenance [Good] → Inspection, monitoring and maintenance of the Settling Pond [Good]

Risk Scenario Bowtie

Code

RR-R-00063

Scenario

Mining operations which could cause Level 4 impact to the environment (water)

Event

Impact to water (Level 4)

Mitigative Controls	Consequences
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- P000081 Community Engagement Plan (Community Engagement Plan) [Average]
- HSM0001C Emergency Management Plan (Emergency Management Plan) [Good]
- Weekly sampling at discharge point L171 and L160 (Independent third party sampling) [Assessed]
- Monitoring equipment L171, alarm and operator response (Alarm and operator response) [Good]

→ Contaminated water discharge with the potential to impact the environment [Environment & Community]

Current Significant medium term impact on important environment/habitat and/or widespread local community complaints. / Rare (1)

Moderate

Proposed Significant medium term impact on important environment/habitat and/or widespread local community complaints. / Rare (1)

Moderate

→ Change in creek grade with the potential to impact the environment [Environment & Community]

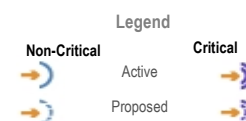
- HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]
- Emergency Management Plan and TARPs [Good]

Current Significant medium term impact on important environment/habitat and/or widespread local community complaints. / Rare (1)

Moderate

Proposed Significant medium term impact on important environment/habitat and/or widespread local community complaints. / Unlikely (2)

High





Causes	Preventative Controls
<p> Cross contamination of regional aquifers from mine floor heave [Unlikely (2)]</p>	<ul style="list-style-type: none"> Aquifer Depressurisation Annual Report (Monitor aquifer depressurisation and TARPS) [Good] CPW001M Ground Control Management Plan (Aquifer/weight balance modelling) [Good] Aquifer Depressurisation Annual Report (Optimisation of groundwater extraction to minimise subsidence effects) [Good]
<p> Cross contamination of regional aquifers as a result of exploration drilling activities [Unlikely (2)]</p>	<ul style="list-style-type: none"> Third party contractual agreement (drilling contractors) [Good]
<p> Cross contamination of regional aquifers as a result of historical drilling activities or mine related bores [Possible (3)]</p>	<ul style="list-style-type: none"> LV Regional Groundwater Management Plan - Regional Bore (Maintenance of the regional bore database) [Good] LV Regional Groundwater Management Plan - Regional Bore (Inspection and maintenance program for regional bores) [Good]

Risk Scenario Bowtie

Code

RR-R-00064

Scenario

Sustained changes to the aquifer properties or structures which may impact future users or sensitive receptors

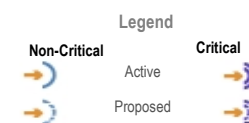
Event

Impact to regional aquifers

Mitigative Controls	Consequences
	<p> Damage to regional aquifers [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2)</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2)</p>

Moderate

Moderate





Causes	Preventative Controls
<p>→ Damage or unauthorised removal of European or Aboriginal Archaeology and Heritage sites due to mining activities [Almost Certain (5)]</p>	<p>→ Cultural Heritage Management Plans (CHMP) (Cultural Heritage Management Plans (CHMP) in place for current operational areas) [Very Good]</p>
<p>→ Subsidence of overburden dump due to instability from weakened or wet materials [Unlikely (2)]</p>	<p>→ Geotechnical Inspections and TARPS [Good]</p> <p>→ Surface drainage inspection and maintenance [Good]</p>
<p>→ Land movement due to inadequate aquifer depressurisation [Unlikely (2)]</p>	<p>→ Geotechnical Inspections and TARPS [Good]</p> <p>→ Groundwater modelling, extraction and monitoring [Good]</p>
<p>→ Ground movement single batter failure - operations [Possible (3)]</p>	<p>→ Daily Mine Inspections (Daily mine inspections and operator action) [Average]</p> <p>→ Geotechnical Inspections and TARPS [Good]</p> <p>→ CPW001M Ground Control Management Plan (Ground movement modelling and monitoring) [Good]</p>
<p>→ Acid mine drainage from the overburden dump impacting land [Likely (4)]</p>	<p>→ Hydrological model for the overburden dump runoff [Average]</p> <p>→ Environmental site plan (Ongoing Rehabilitation and Seepage Program) [Average]</p>

Risk Scenario Bowtie

Code

RR-R-00065

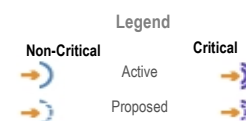
Scenario

Mining operations which could cause consequence Level 1/2 impact to the environment (ground movement / land degradation)

Event

Impact to land (Level 1/2)

Mitigative Controls	Consequences
<p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p>	<p>→ Ground movement / land degradation with the potential to impact the environment [Environment & Community]</p>
	<p>Current Level 1 (0.5) / Likely (4) Moderate</p> <p>Proposed Level 1 (0.5) / Likely (4) Moderate</p>





Causes	Preventative Controls
<p>→ Damage to Saline Waste Outfall Pipeline (SWOP) due ground movement from mining activities [Rare (1)]</p>	<p>→ Subsidence modelling and monitoring [Good]</p> <p>→ Gippsland Water Authority & AGL Agreement (Third party bi-weekly visual inspection of the pipeline) [Good]</p>
<p>→ Regional subsidence due to groundwater extraction from mining activities [Unlikely (2)]</p>	<p>→ LV Regional Groundwater Management Plan (Regional coordination modelling and monitoring of subsidence) [Good]</p> <p>→ Subsidence modelling and monitoring [Good]</p>
<p>→ Fire Services Pond wall failure due to ground movement from a seismic event [Rare (1)]</p>	<p>→ Dam Management Plan (Dam managed as per ANCOLD guidelines) [Good]</p> <p>→ Emergency Management Plan and TARPs [Good]</p>
<p>→ OB run off pond wall failure due to seismic event or extreme rainfall [Rare (1)]</p>	<p>→ Dam Management Plan (Dam managed as per ANCOLD guidelines) [Good]</p> <p>→ Emergency Management Plan and TARPs [Good]</p>
<p>→ Damage to Saline Waste Outfall Pipeline (SWOP) due to internal corrosion/wear [Rare (1)]</p>	<p>→ Gippsland Water Authority & AGL Agreement (Third party bi-weekly visual inspection of the pipeline) [Good]</p> <p>→ Gippsland Water Authority & AGL Agreement (Third party pipe integrity testing) [Good]</p>
<p>→ Fire Services Pond wall failure due to internal drainage failure [Rare (1)]</p>	<p>→ Dam Management Plan (Dam managed as per ANCOLD guidelines) [Good]</p> <p>→ Emergency Management Plan and TARPs [Good]</p>
<p>→ Degradation of land due to pest, plants and animals [Possible (3)]</p>	<p>→ Lease plan conditions (Management of pest plants and animals) [Good]</p> <p>→ Mine Internal Vegetation Management-ICE (Management of weed species) [Good]</p>
<p>→ Change in creek bed grade and flood plains due to land subsidence as a result of aquifer depressurisation [Possible (3)]</p>	

Risk Scenario Bowtie

Code
RR-R-00066

Scenario
Mining operations which could cause Level 3 impact to the environment (ground movement / land degradation) and or public safety

Event
Impact to land (Level 3)

Mitigative Controls	Consequences
<p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p> <p>→ Emergency Management Plan and TARPs [Good]</p>	<p>→ Ground movement / land degradation with the potential to impact the environment [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1) Low</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1) Low</p>
<p>→ External Buffers-Exclusion Zones (Reduced population and human activity in close proximity to affected area (buffer zone)) [Good]</p> <p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p> <p>→ Emergency Management Plan and TARPs [Good]</p>	<p>→ Ground movement / land degradation with the potential to impact public safety [Public Safety]</p> <p>Current Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours) / Rare (1) Low</p> <p>Proposed Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours) / Rare (1) Low</p>

Risk Scenario Bowtie

Causes	Preventative Controls
	<ul style="list-style-type: none"> → CPW001M Ground Control Management Plan (Subsidence modelling and monitoring) [Good] → LV Regional Groundwater Management Plan (Regional coordination modelling and monitoring of subsidence) [Good] → Aquifer Depressurisation Annual Report (Optimisation of groundwater extraction to minimise subsidence effects) [Good] → LV Regional Groundwater Management Plan (Regional and third party monitoring (every 5 years) reported to DEDJTR and Southern Rural Water) [Good] → Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain. [Good]





Causes	Preventative Controls
<p>→ Localised ground movement as a result of subsidence due to mining activities affecting local roads [Possible (3)]</p>	<p>→ CPW001M Ground Control Management Plan (Ground movement modelling and monitoring) [Good]</p> <p>→ CPW001M Ground Control Management Plan (Geotechnical Inspections and TARPS) [Good]</p>
<p>→ Planned Traralgon Bypass and associated development to impact surface water and mine stability [Rare (1)]</p>	<p>→ AGL to engage with the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed. [Assessed]</p>
<p>→ Subsidence due to coal block sliding impacting Traralgon Creek Road. [Likely (4)]</p>	<p>→ Geotechnical Inspections and TARPS [Good]</p> <p>→ Surface drainage inspection and maintenance [Good]</p> <p>→ Subsurface (horizontal drains) drainage inspection and maintenance [Good]</p>
<p>→ Settling Pond wall failure due to ground movement as a result of mining activities [Unlikely (2)]</p>	<p>→ Dam Management Plan (Emergency Management Plan and TARPs) [Good]</p> <p>→ Inspection, monitoring and maintenance of the Settling Pond [Good]</p>

Risk Scenario Bowtie

Code

RR-R-00067

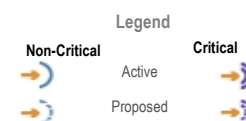
Scenario

Mining operations which could cause Level 4/5 impact to the environment (ground movement / land degradation) and or public safety

Event

Impact to land (Level 4/5)

Mitigative Controls	Consequences
<p>→ Emergency Management Plan and TARPs [Good]</p> <p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p>	<p>→ Ground movement / land degradation with the potential to impact public safety [Public Safety]</p> <p>Current Serious harm to a member or injury to members of the public. Members of the public required to be displaced for a long period of time (days) / Rare (1) Moderate</p> <p>Proposed Serious harm to a member or injury to members of the public. Members of the public required to be displaced for a long period of time (days) / Unlikely (2) High</p>
<p>→ Emergency Management Plan and TARPs [Good]</p> <p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p>	<p>→ Ground movement / land degradation with the potential to impact the environment [Environment & Community]</p> <p>Current Significant medium term impact on important environment/habitat and/or widespread local community complaints. / Rare (1) Moderate</p> <p>Proposed Significant medium term impact on important environment/habitat and/or widespread local community complaints. / Unlikely (2) High</p>
<p>→ Dam Management Plan (Emergency Management Plan and TARPs) [Good]</p> <p>→ HSM0001C Emergency Management Plan (Emergency Response Procedure) [Good]</p>	<p>→ Settling pond dam wall failure induced flood event with the potential to impact public safety [Public Safety]</p> <p>Current Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p> <p>Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p>





Causes	Preventative Controls
<p>→ Fugitive dust emissions from excavation/dumping activities during handling of leached ash [Possible (3)]</p>	<p>→ Confirm the particle size of the leached ash associated with the fugitive dust emissions from excavation/dumping activities. [Assessed]</p> <p>→ CPG001M Dust Suppression Control Procedure (Operational Controls for Dust Suppression procedure (TARP)) [Good]</p>
<p>→ Fugitive dust emissions from mine operation (mining and earth works) due to high wind events (27 km/h) [Possible (3)]</p>	<p>→ CPG001M Dust Suppression Control Procedure (Operational Controls for Dust Suppression procedure (TARP)) [Good]</p> <p>→ CPG001M Dust Suppression Control Procedure (Dust Suppression work instruction (PRWF044M)) [Good]</p> <p>→ CPG001M Dust Suppression Control Procedure (Dust source suppression activities) [Good]</p>
<p>→ Fugitive dust emissions from crushed rock used for roads and general civil building activities onsite due to high wind events [Possible (3)]</p>	<p>→ CPG001M Dust Suppression Control Procedure (Operational Controls for Dust Suppression procedure (TARP)) [Good]</p> <p>→ CPG001M Dust Suppression Control Procedure (Dust Suppression work instruction (PRWF044M)(16837)) [Good]</p>
<p>→ Fugitive dust emissions due to handling of black coal [Unlikely (2)]</p>	<p>→ Develop a procedure to manage dust emissions from handling of black coal (update the existing briquette delivery procedure). [Good]</p>

Risk Scenario Bowtie

Code

RR-R-00068

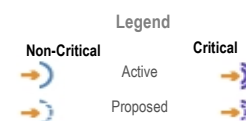
Scenario

Mining operations generating fugitive dust emissions which may impact public safety and/or loss of amenity/nuisance



Event

Fugitive dust emissions

Mitigative Controls	Consequences
<p>→ Review the effectiveness of spray coverage and increase the implementation of the automated spray. [Assessed]</p> <p>→ Loy Yang Mining Licence 5181 Work Plan (Rehabilitated land) [Good]</p> <p>→ P000081 Community Engagement Plan (Community Engagement Plan) [Average]</p>	<p>→ Fugitive dust emissions with the potential to impact public safety [Public Safety]</p> <p>Current Nuisance event to public safety (no medical attention) / Unlikely (2) Moderate</p> <p>Proposed Nuisance event to public safety (no medical attention) / Unlikely (2) Moderate</p>
<p>→ Loy Yang Mining Licence 5181 Work Plan (Rehabilitated land) [Good]</p> <p>→ Investigate the use of Compressed Air Foam (CAF) for dust suppressions. [Assessed]</p> <p>→ Review the effectiveness of spray coverage and increase the implementation of the automated spray. [Assessed]</p> <p>→ Environmental site plan (Monitoring of air emissions and exposure levels) [Average]</p>	<p>→ Loss of amenities due to fugitive dust emissions (visual/nuisance) [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2) Moderate</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2) Moderate</p>





Causes	Preventative Controls
<p> Noise emissions from mining related activities [Possible (3)]</p>	<p> Buffer zone between site and residences [Good]</p>

Risk Scenario Bowtie

Code




RR-R-00069

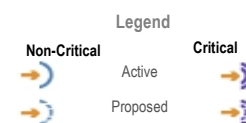
Scenario

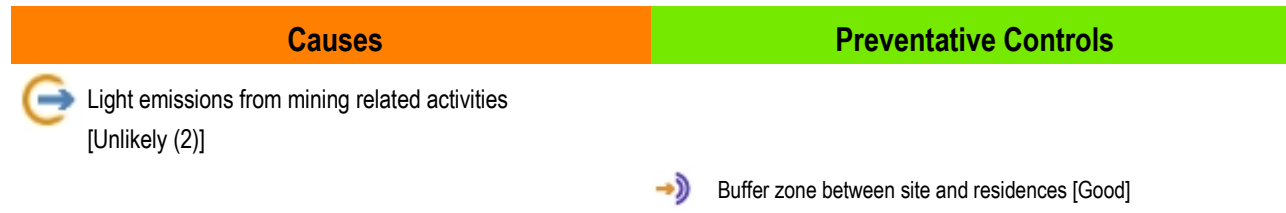
Mining operations generating noise which could cause nuisance or loss of amenity

Event

Noise emissions

Mitigative Controls	Consequences
<p> Complaints Registry Procedure (P00063) [Assessed]</p> <p> Maintain noise signature model [Assessed]</p>	<p> Noise emissions with the potential to result in nuisance and/or loss of amenity to the local community [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2) Moderate</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2) Moderate</p>





Risk Scenario Bowtie

Code

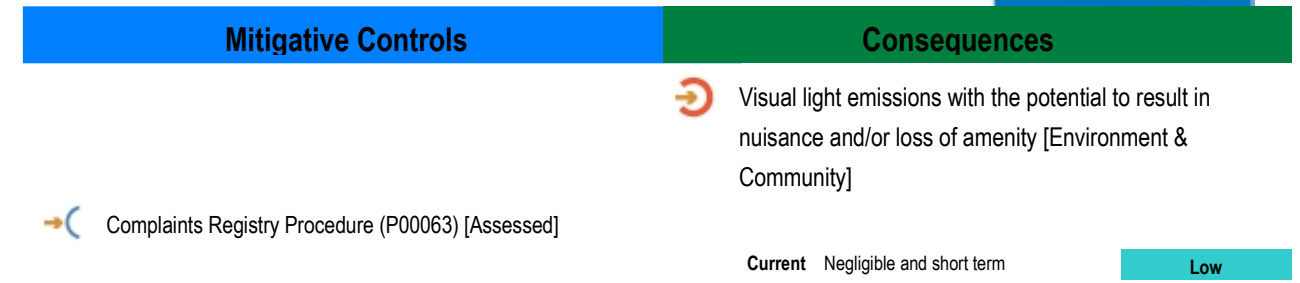
RR-R-00070

Scenario

Mining operations generating light emissions which could cause nuisance or loss of amenity

Event

Visual light emissions

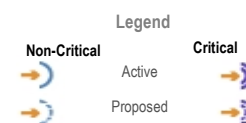


Current Negligible and short term environmental impact to localised area of Negligible environmental value. No impact beyond AGL's operational area. No interest by local community. / Rare (1)

Low

Proposed Negligible and short term environmental impact to localised area of Negligible environmental value. No impact beyond AGL's operational area. No interest by local community. / Rare (1)

Low





Causes	Preventative Controls
<p>→ Insufficient topsoil to complete final rehabilitation for the open cut mine [Rare (1)]</p>	<p>→ Loy Yang Mining Licence 5181 Work Plan Variation [Good]</p> <p>→ Continue to investigate alternative sources of topsoil, or alternative materials (include 4 year investigation on artificial topsoil study with Federation University). [Good]</p>
<p>→ Ground subsidence of rehabilitated landform post mining operations [Rare (1)]</p>	<p>→ Develop and implement the Mine Closure Plan [Good]</p> <p>→ Loy Yang Mining Licence 5181 Work Plan Variation [Good]</p>
<p>→ Acid mine drainage from the overburden dump impacting Traralgon Creek water quality [Rare (1)]</p>	<p>→ Develop and implement the Mine Closure Plan [Good]</p> <p>→ Loy Yang Mining Licence 5181 Work Plan Variation [Good]</p>
<p>→ Fire risk during mine closure progress [Rare (1)]</p>	<p>→ Develop and implement the Mine Closure Plan [Good]</p> <p>→ Loy Yang Mining Licence 5181 Work Plan Variation [Good]</p>

Risk Scenario Bowtie

Code

RR-R-00071

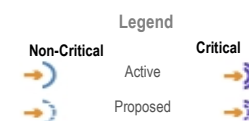
Scenario

Post closure of mine future hazards which could impact the environment or public safety

Event

Post rehabilitation/fire

Mitigative Controls	Consequences
<p>→ Rehabilitation Fire Suppression Systems [Good]</p> <p>→ Vic police and CFA Response [Assessed]</p>	<p>→ Environmental impacts from unsuccessful rehabilitation - Land, Aquifer and Surface Water [Environment & Community]</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2)</p> <p style="text-align: right; background-color: #f4a460; padding: 2px;">Moderate</p>
<p>→ Rehabilitation Fire Suppression Systems [Good]</p> <p>→ Vic police and CFA Response [Assessed]</p>	<p>→ Fire risk with the potential to impact public safety [Public Safety]</p> <p>Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1)</p> <p style="text-align: right; background-color: #ffcc00; padding: 2px;">High</p>
<p>→ Rehabilitation Fire Suppression Systems [Good]</p> <p>→ Vic police and CFA Response [Assessed]</p>	<p>→ Environmental risk from smoke with the potential to impact public amenities [Environment & Community]</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1)</p> <p style="text-align: right; background-color: #00b050; padding: 2px;">Low</p>
<p>→ Rehabilitation Fire Suppression Systems [Good]</p> <p>→ Vic police and CFA Response [Assessed]</p>	<p>→ Smoke risk with the potential to impact the public safety [Public Safety]</p> <p>Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1)</p> <p style="text-align: right; background-color: #ffcc00; padding: 2px;">High</p>





Causes	Preventative Controls
<p>→ Spill during unloading due to maloperation [Possible (3)]</p>	<ul style="list-style-type: none"> → HSW707 Unloading of Bulk Chemical Tankers Work Instruction (Procedure for unloading of bulk chemical (generic)) [Good] → Bunding (Deliveries undertaken within a bunded area.) [Good] → Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding. [Good]
<p>→ Spill during unloading due to hose failure [Possible (3)]</p>	<ul style="list-style-type: none"> → HSW707 Unloading of Bulk Chemical Tankers Work Instruction (Procedure for unloading of bulk chemical (generic)) [Good] → Bunding (Deliveries undertaken within a bunded area.) [Good] → Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding. [Good]
<p>→ Spill due to tanker accident [Unlikely (2)]</p>	<ul style="list-style-type: none"> → Third party chemical suppliers (Competent and reputable third party tanker drivers) [Average]
<p>→ Failure of underground storage tank from corrosion resulting in groundwater contamination [Possible (3)]</p>	<ul style="list-style-type: none"> → Ensure that the underground storage tanks are compliant with the Vic EPA UPSS guidelines. [Assessed] → Maintenance Routine - Tanks [Good]
<p>→ Tank overfill due to maloperation [Possible (3)]</p>	<ul style="list-style-type: none"> → HSW707 Unloading of Bulk Chemical Tankers Work Instruction (Procedure for unloading of bulk chemical (generic)) [Good] → Bunding (Deliveries undertaken within a bunded area.) [Good] → Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding. [Good]
<p>→ Spill whilst using mobile fill points [Possible (3)]</p>	<ul style="list-style-type: none"> → Third party contractor RTL - Refuelling of Mobile Plant (RTL-OPS-WI-021) [Average]

Risk Scenario Bowtie

Code
RR-R-00072




Scenario
Loss of containment of chemicals which could impact the environment

Event
Hazardous chemicals

Mitigative Controls	Consequences
<ul style="list-style-type: none"> → HSM0001C Emergency Management Plan (Emergency Management Plan) [Good] → Weekly sampling at discharge point L171 and L160 (Independent third party sampling) [Assessed] → Monitoring equipment L171, alarm and operator response (Alarm and operator response) [Good] 	<p>→ Contaminated water discharge with the potential to impact the environment [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2) Moderate</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Unlikely (2) Moderate</p>
<ul style="list-style-type: none"> → HSM0001C Emergency Management Plan (Emergency Management Plan) [Good] 	<p>→ Contaminated land with the potential to impact the environment [Environment & Community]</p> <p>Current Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community. / Unlikely (2) Moderate</p> <p>Proposed Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community. / Unlikely (2) Moderate</p>



Risk Scenario Bowtie

Causes	Preventative Controls
 Spill due to corrosion of aboveground tank [Possible (3)]	 Maintenance Routine - Tanks [Good]  Ensure that the underground storage tanks are compliant with the Vic EPA UPSS guidelines. [Assessed]





Causes	Preventative Controls
<p>→ Hot surface temperature of brakes on conveyors, dredgers/stackers [Likely (4)]</p>	<ul style="list-style-type: none"> → Detection and suppression on conveyor lines [Average] → General Housekeeping (Work area inspection will trigger the cleaning procedure) [Assessed] → Mechanical Maintenance Routine (Maintenance routine on all brakes) [Good] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Electrical sources of ignition [Likely (4)]</p>	<ul style="list-style-type: none"> → Electrical routine maintenance [Good] → Electrical Safety Systems (Earth leakage (residual current devices) and overcurrent protection devices) [Good] → Detection and suppression on electrical equipment [Average] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Ember attack from bush fire or grass fire [Likely (4)]</p>	<ul style="list-style-type: none"> → PCY000022 Fire Risk Management Plan (Period specific plans put in place prior to high fire danger days) [Good] → External Buffers-Exclusion Zones (Buffer zone between coal mine and public access) [Good] → Environmental site plan - vegetation management (Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine) [Good] → Third party high danger period alerts (CFA/DEP/MFB alert on high danger period.) [Assessed] → PCY000022 Fire Risk Management Plan (Mine Fire Preparedness and Prevention Procedure) [Good] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good] → PCY000022 Fire Risk Management Plan (Clay capping) [Good]
<p>→ Bearing Friction Failure [Likely (4)]</p>	<ul style="list-style-type: none"> → Detection and suppression on conveyor lines [Average] → General Housekeeping (Work area inspection will trigger the cleaning procedure) [Assessed] → Mechanical Maintenance Routine (Maintenance routine on bearings) [Good] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Hot Works [Likely (4)]</p>	<ul style="list-style-type: none"> → HSP900 Permit to work system (Hot work permit system) [Very Good]

Risk Scenario Bowtie

Code

RR-R-00073

Scenario

Significant fire within/near the Mine lease area which may impact public safety and the environment

Event

Mine fire

Mitigative Controls	Consequences
<ul style="list-style-type: none"> → P000081 Community Engagement Plan (Community Engagement Plan) [Average] → Vic police and CFA Response [Assessed] → Security Management Plan (Incident (crime) management and escalation of security arrangements) [Good] → HSM0001C Emergency Management Plan (Emergency Management Plan) [Good] → Fixed Mine Fire Detection and Suppression Equipment [Good] → HSM0001C Emergency Management Plan (Emergency Response Equipment) [Good] 	<p>→ Fire risk with the potential to impact public safety [Public Safety]</p> <p>Current Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p> <p>Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p> <hr/> <p>→ Environmental risk from smoke with the potential to impact public amenities [Environment & Community]</p> <ul style="list-style-type: none"> → HSM0001C Emergency Management Plan (Emergency Management Plan) [Good] → Fixed Mine Fire Detection and Suppression Equipment [Good] → HSM0001C Emergency Management Plan (Emergency Response Equipment) [Good] → P000081 Community Engagement Plan (Community Engagement Plan) [Average] <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1) Low</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1) Low</p> <hr/> <p>→ Smoke risk with the potential to impact the public safety [Public Safety]</p> <ul style="list-style-type: none"> → Loy Yang Mining Licence 5181 Work Plan (Rehabilitated land) [Good] → HSM0001C Emergency Management Plan (Emergency Response Equipment) [Good] → Fixed Mine Fire Detection and Suppression Equipment [Good] → P000081 Community Engagement Plan (Community Engagement Plan) [Average]

Risk Scenario Bowtie

Causes	Preventative Controls
<p>→ Light or heavy vehicle/mobile/ancillary equipment initiated fire [Likely (4)]</p>	<ul style="list-style-type: none"> → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Ignition through discarded cigarettes [Likely (4)]</p>	<ul style="list-style-type: none"> → Pre Startup Inspections (Pre Startup Inspections checklist triggers clean / washdown procedure) [Average] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good] → Vehicle Standards Procedure (Fire equipment standard for light or heavy vehicle/ancillary equipment) [Good]
<p>→ Spontaneous combustion of coal [Likely (4)]</p>	<ul style="list-style-type: none"> → HRP0024C Corporate Smoking Policy (Restricted smoking areas) [Average] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Transmission tower and distribution lines operated by third party failure resulting in fire [Unlikely (2)]</p>	<ul style="list-style-type: none"> → Daily Mine Inspections (Daily mine inspections by shift management personnel) [Average] → CPW001M Ground Control Management Plan (Fortnightly geotechnical engineering inspection and TARPS) [Good] → PCY000022 Fire Risk Management Plan (Operating practice to excavate and remove and/or apply water on identified hot spot) [Good] → PCY000022 Fire Risk Management Plan (Clay capping/grouting of identified cracks) [Good] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Uncontrolled ignition sources from farming related activities (third party - local lessees) [Possible (3)]</p>	<ul style="list-style-type: none"> → Environmental site plan - vegetation management (Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine) [Good] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good] → Implement oversight to ensure that SPI Ausnet manages their assets in accordance with legislation. [Assessed]

Mitigative Controls	Consequences
<ul style="list-style-type: none"> → Vic police, CFA, EPA and Department of Health Response [Assessed] → HSM0001C Emergency Management Plan (Emergency Management Plan) [Good] 	<p>Current Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p> <p>Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p>

Causes	Preventative Controls
	<ul style="list-style-type: none"> → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good] → Environmental site plan - vegetation management (Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine) [Good]
<p>→ Uncontrolled ignition source within the Mine Lease Area from members of the public [Possible (3)]</p>	<ul style="list-style-type: none"> → External Buffers-Exclusion Zones (Buffer zone between coal mine and public access) [Good] → Environmental site plan - vegetation management (Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine) [Good] → Security Management Plan (Site security undertake regular patrols of the mining lease and surrounding areas.) [Good] → Site Security Fencing and Surveillance Systems (Cameras strategically installed along the site boundary and site perimeter includes security fencing) [Good] → PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]
<p>→ Criminal intent to initiate an arson attack [Likely (4)]</p>	<ul style="list-style-type: none"> → Environmental site plan - vegetation management (Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine) [Good] → External Buffers-Exclusion Zones (Buffer zone between coal mine and public access) [Good] → Third party high danger period alerts (CFA/DEP/MFB alert on high danger period.) [Assessed] → PCY000022 Fire Risk Management Plan (Mine Fire Preparedness and Prevention Procedure) [Good] → Security Management Plan (Escalation of Security Measures) [Good] → PCY000022 Fire Risk Management Plan (Period specific plans put in place prior to high fire danger days) [Good] → Security Management Plan (Site security undertake regular patrols of the mining lease and surrounding areas.) [Good] → Site Security Fencing and Surveillance Systems (Cameras strategically installed along the site boundary and site perimeter includes security fencing) [Good]
<p>→ Belts failure [Likely (4)]</p>	<ul style="list-style-type: none"> → Mechanical Maintenance Routine (Maintenance routine on conveyor belts) [Good] → General Housekeeping (Work area inspection will trigger the cleaning procedure) [Assessed] → Control Safety Devices (Belt alignment and underspeed detection switches) [Good] → Detection and suppression on conveyor lines [Average]

Risk Scenario Bowtie



Causes

Preventative Controls

→ PCY000022 Fire Risk Management Plan (Emergency Response Procedures - Fast Determined Response) [Good]





Causes	Preventative Controls
<p> Damage to natural gas line due to excavation or ground penetration [Unlikely (2)]</p>	<p> HSP900 Permit to work system (Permit to dig) [Very Good]</p>

Risk Scenario Bowtie

Code

RR-R-00074

Scenario

Loss of containment from LP and HP natural gas pipelines

Event

Gas pipelines fire/explosion

Mitigative Controls	Consequences
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- P000081 Community Engagement Plan (Community Engagement Plan) [Average]
- Vic police and CFA Response [Assessed]
- HSM0001C Emergency Management Plan (Emergency Management Plan) [Good]

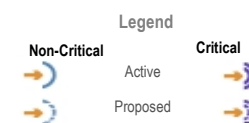
Natural gas pipeline leak and associated fire/explosion with the potential to impact public safety [Public Safety]

Current Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1)

High

Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1)

High





Causes	Preventative Controls
<p> Criminal intent to cause harm to assets within the mine lease [Rare (1)]</p>	<ul style="list-style-type: none"> Site Security Fencing and Surveillance Systems (Cameras strategically installed along the site boundary and site perimeter includes security fencing) [Good] Security Management Plan (Site security undertake regular patrols of the mining lease and surrounding areas.) [Good] Security Management Plan (Escalation of Security Measures) [Good]

Risk Scenario Bowtie

Code
RR-R-00075

Scenario
Criminal act which may impact public safety and/or the environment

Event
Criminal act

Mitigative Controls	Consequences
<ul style="list-style-type: none"> Security Management Plan (Security Response Procedure) [Good] Agency and government response [Assessed] HSM0001C Emergency Management Plan (Emergency Response Plan) [Good] 	<p> Criminal related hazard with the potential to impact public safety [Public Safety]</p> <p>Current Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p> <p>Proposed Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks) / Rare (1) High</p> <hr/> <p> Criminal related hazard with the potential to impact the environment [Environment & Community]</p> <p>Current Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1) Low</p> <p>Proposed Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s). / Rare (1) Low</p>



APPENDIX D – CRITICAL CONTROLS

This appendix lists the critical controls that reduce the likelihood and or mitigate the impact of an environmental and or public safety incident. These were identified during the risk assessment process.

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00088	HSP900 Permit to work system	Critical Control	<p>Systems and procedures are used to minimise the risk when conducting hot work. End of day shift collect all hot work permits and hand over to night shift where all fire watch requirements are captured. Night shift sign off on inspections as done during the evening</p> <p>Control is rated as very good based on collective acknowledgement of the importance of this inspection ahead of other shift tasks.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Very Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be VERY GOOD.</p>	Very Good	Administrative
BC-00109	Site Security Fencing and Surveillance Systems	Critical Control	<p>Cameras are strategically installed along the site and monitored. On the observation of suspicious activities, AGL responds accordingly.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Engineering
BC-00142	Control Safety Devices	Critical Control	<p>The control safety devices are installed on all head-ends and tail-ends of conveyors. In the event of belt misalignment, conveyors are shut down on alarm.</p> <p>Under-speed detectors are installed on all driven pulleys. The under-speed detection system alarms and trips.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Engineering/Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Engineering
BC-00150	Electrical routine maintenance	Critical Control	<p>This includes general maintenance on electrical systems that include switch rooms, cabinets, MCCs, motors and etc.</p> <p>Thermography is also conducted to identify potential hot spots within electrical systems.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00179	Electrical Safety Systems	Critical Control	<p>Electrical equipment is provided with earth leakage (residual current device) and overcurrent protection devices, as required by the governing legislation.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Engineering - Reliability: V. Good - Monitoring/Auditing: Performance monitoring (includes oversight of electrical systems which is undertaken by the responsible electrical regulator) <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Engineering
BC-00186	HSM0001C Emergency Management Plan	Critical Control	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00199	External Buffers-Exclusion Zones	Critical Control	<p>Exclusion Zones 0110 code. The land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license.</p> <p>The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. This include activities such as farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.</p> <p>Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria. Exclusion zones around electrical infrastructure</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Isolation - Reliability: Good - Monitoring/Auditing: None <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Isolation
BC-00216	CPW001M Ground Control Management Plan	Critical Control	<p>GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group.</p> <p>Stability analysis and batter design, ground movement modelling (predictions).</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00310	HRP0024C Corporate Smoking Policy	Critical Control	<p>AGL Loy Yang Smoking Rules - applicable to all Loy Yang activities onsite.</p> <p>Restricted smoking areas designated above grass level. No designated smoking areas in the mine below grass level or around coal carrying equipment. Smoking below grass level in the mine is cause for immediate dismissal in accordance with Corporate Smoking Policy HRP0024C AGL Loy Yang Smoking Rules.</p> <p>AGL Golden Rules are in place as a set of clear rules on what can result as a breach of a safety rule, such as smoking in a restricted area. A breach of the Golden Rules by anyone at an AGL site may result in disciplinary action being taken, which may include termination of employment.</p> <p>The base control is assessed via the following: - Implemented: Yes - Type: Behavioural - Reliability: Good - Monitoring/Auditing: Ad-hoc</p> <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Average	Administrative
BC-00337	Fixed Mine Fire Detection and Suppression Equipment	Critical Control	<p>This activity involve the activation of spray lines and other suppression equipment as installed as fixed assets within the mine.</p> <p>These assets are designed in accordance with Mine Fire Service design guidelines, which include key assets such as:</p> <ul style="list-style-type: none"> - the ability to cover 50% of the operational mine area with water - capacity to supply 6400 L/sec to the mine spray line systems - gravity supply of water from two locations namely fire service reservoir and High Level Storage Dam - CFA compliant couplings every 50 m along operational spray lines - strategically located truck fill points - duplicated power supply to all mine key asset - the fire main runs the length of the conveyor (either side) and has spray units located at intervals that allow complete coverage of the conveyor - the main on the operating side of the conveyor is charged - the main on the non-operating side is uncharged however all sprinkler points are open allowing activation of all sprinklers by charging the main - dredgers are fitted with firewater tank (~2 kL) for initial response - Hoses and extinguishers available at transfer points and at head ends - Sprinkler, deluge and hose systems on dredgers/stackers fed from fire main <p>The base control is assessed via the following: - Implemented: Yes - Type: Engineering/Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring</p> <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Engineering

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00405	Water Management Plan	Critical Control	<p>Inputs from the hydrological model and monitoring for the overburden dump runoff form the basis of the Water Treatment System.</p> <p>The system includes the following water treatment: - caustic addition for pH adjustment - cationic polymer for turbidity - indirectly 10% of total dissolved solids removed with the dosing, 20% reduced by mixing with power station water</p> <p>The system alarms on the operating level and pH of incoming water.</p> <p>The base control is assessed via the following: - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring</p> <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00408	Environmental site plan	Critical Control	<p>The plan specifies the allowable discharge limits as referenced in the EPA licence 11149 conditions.</p> <p>This includes ongoing visual inspection and remediation of targeted areas following the hydrological model and monitoring.</p> <p>The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Fair - Monitoring/Auditing: None</p> <p>Based on the above, the effectiveness is assessed to be AVERAGE.</p>	Average	Administrative
BC-00409	Monitoring equipment L171, alarm and operator response	Critical Control	<p>The equipment continuously monitor pH, turbidity, temperature and conductivity.</p> <p>Operator periodically monitors the systems and responds to alarms.</p> <p>The base control is assessed via the following: - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring</p> <p>Based on the above, the effectiveness of the control is assessed as GOOD.</p>	Good	Administrative
BC-00413	Dam monitoring program	Critical Control	<p>Program specifies the monitoring program associated with dams and how they are to be built.</p> <p>The base control is assessed via the following factors: - Implementation: Yes - Control type: Administrative - Reliability rating: Good - Monitoring/Auditing: Performance monitoring</p> <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00414	Groundwater Monitoring Plan	Critical Control	<p>This includes consideration for environmental issues with regards to groundwater interactions as well as geotechnical stability.</p> <p>The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Fair - Monitoring/Auditing: Ad-Hoc</p> <p>Based on the above, the effectiveness of the control is assessed as AVERAGE.</p>	Average	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00415	Operational Monitoring Program for the dredging activity	Critical Control	<p>This activity involves observational inspection and sets the operational control for water balance. It provides an opportunity to suspend operation when operating limits are exceeded.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00419	Containment of mine drainage within the Mine Lease Area	Critical Control	<p>Drainage system contains retention ponds and flow regulation (up to 1 in 2 year storm events).</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Engineering - Reliability: Good - Monitoring/Auditing: Ad-Hoc <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Engineering
BC-00423	Dam Management Plan	Critical Control	<p>Dam management plan includes TARPs to which will trigger a response to mitigate the effects of ground movement.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00425	Aquifer Depressurisation Annual Report	Critical Control	<p>This annual report specifies the volumes of artesian dewatering required to maintain mine stability.</p> <p>This is considered a critical activity for mine stability. It is a mature and established process. It is essential in maintaining safe operations within the mine. The process is monitored and reviewed. There is also an external audit required within the process.</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative - Reliability rating: Very Good - Monitoring/Auditing: Monitored and audited <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00429	Gippsland Water Authority & AGL Agreement	Critical Control	<p>The agreement sets the roles and responsibilities between AGL and Gippsland Water regarding the management of the SWOP pump station and pipeline.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness is assessed to be GOOD .</p>	Good	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00431	CPG001M Dust Suppression Control Procedure	Critical Control	<p>This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00433	Vehicle Standards Procedure	Critical Control	<p>Vehicle standard (incorporate aspects of CFA Act) sets out the requirements for all vehicles, which includes but not limited to:</p> <ul style="list-style-type: none"> - fire extinguisher - two way radio - fire hose and branch - detection/suppression on mobile plant <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Engineering/Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00435	PCY000022 Fire Risk Management Plan	Critical Control	<p>The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00439	Surface drainage inspection and maintenance	Critical Control	<p>Surface drainage maintenance (including clay capping) to minimise surface water inflows to coal joints, horizontal drains (monitoring and maintenance), regular stability assessment and modelling using current groundwater levels (TARP).</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative - Reliability rating: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed as GOOD.</p>	Good	Administrative
BC-00440	Subsurface (horizontal drains) drainage inspection and maintenance	Critical Control	<p>Although drains are considered to be an engineering control, they could be blocked (restriction in flow) if not appropriately maintained, therefore, it is considered to be an administrative type control. The control is regularly monitored and there is annual inspection.</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative - Reliability rating: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00441	Geotechnical Inspections and TARPS	Critical Control	<p>Based on the results of the inspection, further activities are undertaken as required, which may include pin monitoring. Carry out mine inspections following significant rainfall events (consistent with TARP) or other defined trigger events including ground movement episodes and seismic events. Key stability monitoring bores have been identified and are monitored at regular intervals and in association with trigger rainfall events.</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative - Reliability rating: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00442	Emergency Management Plan and TARPS	Critical Control	<p>TARPs will trigger actions to mitigate the events of ground movement.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00443	Inspection, monitoring and maintenance of the Settling Pond	Critical Control	<p>Program for the inspection, monitoring and maintenance of the Settling Pond.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00446	Lease plan conditions	Critical Control	<p>Lease plan specifies how land is to be managed regarding pest, plants and animals.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>This is an active management control.</p> <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00449	LV Regional Groundwater Management Plan - Regional Bore	Critical Control	<p>Through the ongoing updating and maintenance of the regional bore database, potential high risk bores are identified and remediation plans are adopted, as appropriate.</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative/Engineering - Reliability rating: Good - Monitoring/Auditing: Performance monitoring <p>The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.</p> <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00450	Third party contractual agreement (drilling contractors)	Critical Control	<p>The contractual agreement specifies how drilling activities are to be undertaken.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited <p>Based on the above, the effectiveness of the control is considered as GOOD.</p>	Good	Administrative
BC-00452	Buffer zone between site and residences	Critical Control	<p>Exclusion Zones 0110 code. Planning controls mandate buffer zones between the site and residences to minimise the number of potential receptors. Tree planting and screening within the buffer zones. This land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license. The planning zone ultimately results in reduced population, i.e. reduced human activity in this zone.</p> <p>The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. These activities include farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.</p> <p>Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria.</p> <p>Exclusion zones around electrical infrastructure</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative (some aspects of isolation) - Reliability: Very Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Isolation
BC-00467	Environmental site plan - vegetation management	Critical Control	<p>This plan manages the fire risks on the mine and surrounding areas, including reduced fuel loads (grazing/spraying/slashing), fire breaks and mineral earth breaks.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited <p>Based on the above, the effectiveness is assessed as GOOD.</p>	Good	Administrative
BC-00469	Mechanical Maintenance Routine	Critical Control	<p>Preventative maintenance program is designed to maintain equipment to minimise integrity related problems / and or unexpected failure.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and Audited <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00470	Detection and suppression on conveyor lines	Critical Control	<p>Some of the equipment will have automated detection and suppression on coal delivering structure. Other equipment items are reliant on activation of the manual fire suppression systems.</p> <p>The Raw Coal Bunker and Crusher House fire detection and suppression system includes:</p> <ul style="list-style-type: none"> - Very Early Smoke Detection Alarm - Thermal imaging cameras - Manual deluge (operator initiated) <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Part (fully implemented on the rising conveyors) - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be AVERAGE.</p>	Average	Engineering
BC-00471	Detection and suppression on electrical equipment	Critical Control	<p>Switch rooms (post 2012) and some of the equipment (post 2012) will have automated detection and suppression. Other equipment items are reliant on activation of the manual fire suppression systems.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Part (fully implemented in switch rooms post 2012) - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be AVERAGE</p>	Average	Engineering
BC-00474	Security Management Plan	Critical Control	<p>The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Very Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>	Good	Administrative
BC-00476	HSW707 Unloading of Bulk Chemical Tankers Work Instruction	Critical Control	<p>The procedure includes appropriate steps and precautions to be undertaken to minimise the potential of a spill during bulk tanker unloading.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00477	Bundling	Critical Control	<p>Existing bunding within the mine lease area is assessed to be in an appropriate condition to contain a spill.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Engineering

Tag ID	Name	Control Category	Comments	Effectiveness	Type/Factor
BC-00478	Third party chemical suppliers	Critical Control	<p>The site engages chemical suppliers that comply with the Australian Dangerous Goods (ADG) codes.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Part (Third party control) - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be AVERAGE.</p>	Average	Administrative
BC-00479	Maintenance Routine - Tanks	Critical Control	<p>Inspections of aboveground and underground storage tanks is undertaken in line with the relevant standards.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc (Annual performance statement audit undertaken by an EPA auditor) <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00482	Third party contractual agreement (lessees)	Critical Control	<p>Lease agreement specifies that lessees must comply with the CFA Act. This includes:</p> <ul style="list-style-type: none"> - supply of fire suppression equipment - maintenance of lessee equipment - the observation of fire restrictions on total fire ban days - fuel reduction requirements <p>AGL undertakes audits on lessees compliant with the above requirements.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative
BC-00483	Loy Yang Mining Licence 5181 Work Plan	Critical Control	<p>The work plan includes:</p> <ul style="list-style-type: none"> - commitments to government on key components on the mine rehabilitation - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine - outlines progressive mine rehabilitation <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>	Good	Administrative

APPENDIX E – RECOMMENDATIONS

This appendix lists the recommendations raised during the risk assessment workshop. A total of 27 recommendations were raised to further reduce the risk of an incident. The complete list of risk reduction recommendations are shown below. The recommendations raised in the workshop should be assessed for criticality, practicality and effectiveness to be carried forward to close-out as addressed in the Management Plan.

Open Actions



Action Code	Objective: Work to be Done	Priority	Owner	Currently With	Due	Status
RR-A-00003	Determine the particle size of the leached ash that is associated with the fugitive dust emissions as a result of excavation/dumping activities.:	Normal				Pending
	Source RR-COP-02336 Fugitive dust emissions					
RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.:	Normal				Pending
	Source BC-00216 CPW001M Ground Control Management Plan BC-00216 Impact to water (Level 4) BC-00216 Impact to land (Level 4/5) BC-00216 Mine fire BC-00216 Impact to regional aquifers BC-00216 Impact to land (Level 3) BC-00216 Collapse of Major Mining Plant BC-00216 Impact to land (Level 1/2)					
RR-A-00016	Conduct an assessment of the OH&S risk of responders' exposure to firewater (hygiene), smoke, carbon monoxide and voids from fire activities:	Normal				Pending
	Source RR-COM-02825 Mine fire					
RR-A-00019	Amend the trigger action response plan to include visual inspections of public roads which are potentially at risk.:	Normal				Pending
	Source RR-COP-02639 Impact to land (Level 4/5)					
RR-A-00020	Finalise the Water Management Plan and associated TARPs (including OB & Settling Pond systems).:	Normal				Pending
	Source BC-00405 Water Management Plan BC-00405 Impact to water (Level 1/2) BC-00405 Impact to water (Level 4) BC-00405 Impact to water (Level 3)					
RR-A-00021	Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.:	Normal				Pending
	Source RR-COP-03010 Impact to water (Level 4) RR-COP-03016 Impact to land (Level 3)					
RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).:	Normal				Pending
	Source					

Open Actions



Action Code	Objective: Work to be Done	Priority	Owner	Currently With	Due	Status
RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves):	Normal				Pending
	Source					
	BC-00411 Install upgraded SCADA on-line monitoring and dosing equipment					
	BC-00409 Monitoring equipment L171, alarm and operator response					
	BC-00409 Impact to water (Level 1/2)					
	BC-00409 Hazardous chemicals					
	BC-00409 Impact to water (Level 4)					
	BC-00409 Impact to water (Level 3)					
RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.:	Normal				Pending
	Source					
	BC-00423 Dam Management Plan					
	RR-COP-03036 Impact to water (Level 3)					
	BC-00423 Impact to land (Level 4/5)					
	BC-00423 Impact to land (Level 3)					
RR-A-00025	Formalise the activity of lime dosing (pH correction) at the base of the mine.:	Normal				Pending
	Source					
	BC-00448 Operating procedure - lime addition					
	BC-00448 Impact to water (Level 1/2)					
RR-A-00027	Investigate the potential impacts of sustained changes to regional aquifer properties or structures to receptors (e.g. future water users or other sensitive receptors) as a result of the depletion of regional aquifers due to the current mining practice where groundwater is extracted to maintain mine stability.:	Normal				Pending
	Source					
	RR-R-00064 Impact to regional aquifers					
RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.:	Normal				Pending
	Source					
	BC-00435 PCY000022 Fire Risk Management Plan					
	BC-00435 Mine fire					
RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.:	Normal				Pending
	Source					
	BC-00437 Loy Yang Mining Licence 5181 Work Plan Variation					
	BC-00475 Develop and implement the Mine Closure Plan					

Open Actions



Action Code	Objective: Work to be Done	Priority	Owner	Currently With	Due	Status
RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.:	Normal				Pending
	Source					
	RR-COP-03144 Post rehabilitation/fire					
	RR-COP-03146 Post rehabilitation/fire					
	RR-COP-03152 Post rehabilitation/fire					
	RR-COP-02479 Post rehabilitation/fire					
	RR-COP-03275 Post rehabilitation/fire					
	RR-COP-03276 Post rehabilitation/fire					
RR-A-00037	Undertake an assessment to determine the likelihood and impacts of poor lake water quality to regional aquifers as a result of interchange with the lake.:	Normal				Pending
	Source					
	RR-R-00071 Post rehabilitation/fire					
RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347):	Normal				Pending
	Source					
	BC-00477 Bunding					
	BC-00477 Hazardous chemicals					
	RR-COP-02966 Hazardous chemicals					
	RR-COP-03170 Hazardous chemicals					
	RR-COP-03180 Hazardous chemicals					
RR-A-00039	Verify that third party chemical transport companies comply with the relevant Australian Dangerous Goods codes.:	Normal				Pending
	Source					
	BC-00478 Third party chemical suppliers					
	BC-00478 Hazardous chemicals					
RR-A-00040	Confirm the integrity testing regime for the above and below ground storage tanks.:	Normal				Pending
	Source					
	BC-00479 Maintenance Routine - Tanks					
	BC-00479 Hazardous chemicals					
RR-A-00046	Formalise the process of conducting daily mine inspections which includes looking for obvious ground related issues, i.e. ground movement and hotspots.:	Normal				Pending
	Source					
	BC-00166 Daily Mine Inspections					
	BC-00166 Engulfment					
	BC-00166 Major Fire					
	BC-00166 Mine fire					

Open Actions



Action Code	Objective: Work to be Done	Priority	Owner	Currently With	Due	Status
RR-A-00046	Formalise the process of conducting daily mine inspections which includes looking for obvious ground related issues, i.e. ground movement and hotspots.:	Normal				Pending
	Source BC-00166 Impact to land (Level 1/2)					
RR-A-00050	Investigate the feasibility of installing long range infra-red system to monitor the open cut mining area (coal exposed areas).:	Normal				Pending
	Source BC-00337 Fixed Mine Fire Detection and Suppression Equipment BC-00337 Major Fire BC-00337 Mine fire					
RR-A-00051	Determine the feasibility of installing an automated detection and suppression systems based on a multi-criteria assessment.:	Normal				Pending
	Source BC-00337 Fixed Mine Fire Detection and Suppression Equipment BC-00337 Major Fire BC-00337 Mine fire					
RR-A-00052	Continue to investigate alternative sources of topsoil, or alternative materials (include 4 year investigation on artificial topsoil study with Federation University).:	Normal				Pending
	Source RR-COP-02481 Post rehabilitation/fire					
RR-A-00053	Develop a procedure to manage dust emissions from the handling of black coal (update the existing briquette delivery procedure).:	Normal				Pending
	Source RR-COP-03060 Fugitive dust emissions					
RR-A-00054	AGL should engage the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.:	Normal				Pending
	Source RR-COP-03011 Impact to water (Level 4) RR-COP-02974 Impact to land (Level 4/5)					
RR-A-00055	Implement oversight to ensure that SPI Ausnet manages their assets (transmission tower and distribution lines) in accordance with legislation.:	Normal				Pending
	Source RR-COP-03219 Mine fire					
RR-A-00056	Ensure that the underground storage tanks (one petrol and two diesel) near the Freight Gate are compliant with the Vic EPA UPSS guidelines.:	Normal				Pending
	Source RR-COP-02941 Hazardous chemicals					

Open Actions



Action Code	Objective: Work to be Done	Priority	Owner	Currently With	Due	Status
RR-A-00056	Ensure that the underground storage tanks (one petrol and two diesel) near the Freight Gate are compliant with the Vic EPA UPSS guidelines.:	Normal				Pending
	Source					
	RR-COP-03182 Hazardous chemicals					
RR-A-00057	Post mining closure, install a fire suppression system to prevent and/or mitigate against a mine fire. The system should include a pump station that sources water from the base of the mine and a reticulated system of spray lines to protect exposed coal surfaces. The system can be manually activated.:	Normal				Pending
	Source					
	RR-COM-03164 Post rehabilitation/fire					
	RR-COM-03165 Post rehabilitation/fire					
	RR-COM-03166 Post rehabilitation/fire					
RR-A-00058	Review the effectiveness of spray coverage and increase the implementation of the automated spray coverage in high risk areas to reduce dust emissions.:	Normal				Pending
	Source					
	RR-COM-03063 Fugitive dust emissions					
RR-A-00059	Investigate the use of Compressed Air Foam (CAF) for dust suppressions.:	Normal				Pending
	Source					
	RR-COM-03064 Fugitive dust emissions					
RR-A-00060	Review the effectiveness of spray coverage and increase the implementation of the automated spray coverage in high risk areas to reduce dust emissions.:	Normal				Pending
	Source					
	RR-COM-03278 Fugitive dust emissions					

APPENDIX F – REJECTED CAUSES

This appendix contains the list of rejected events/causes identified during the risk assessment process. The justification for rejecting the event/cause is also documented.

Risk Scenario Rejected Causes



Risk Code	Top Event	Cause Code	Cause Name	Comments	Status
RR-R-00071	Post rehabilitation/fire	RR-CA-00727	Insufficient topsoil to complete final rehabilitation for overburden dump	There is sufficient quantity of topsoil to complete final rehabilitation of the overburden dump. Therefore, this cause is rejected.	Rejected
RR-R-00062	Impact to water (Level 3)	RR-CA-00482	Power station plant failure resulting in discharge of water with high conductivity levels to the Settling Pond	<p>Potential pathways include:</p> <ul style="list-style-type: none"> - plant failure; pumps valves etc. - management of clinker "trash pit" to minimise the likelihood of blockages <p>The Settling Pond is located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.</p>	Rejected
		RR-CA-00483	Water migration from the Ash Pond	<p>Power station discharging saline water and ash into the Ash Pond resulting in a potential of contaminated groundwater migrating beyond the attenuation zone boundary.</p> <p>The Power Station activity and Ash Pond are located outside of the mine lease area, therefore they are assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.</p>	Rejected

Risk Scenario Rejected Causes



Risk Code	Top Event	Cause Code	Cause Name	Comments	Status
RR-R-00063	Impact to water (Level 4)	RR-CA-00490	Additional water flow down Traralgon Creek due to High Level Storage Dam or Settling Pond wall failure	<p>Possible pathways include:</p> <ul style="list-style-type: none"> - dam wall collapse (deterioration of dam structure) - seismic event - piping failure/erosion etc <p>These pathways may result in additional water flow down Traralgon Creek.</p> <p>The High Level Storage Dam and Settling Pond are located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.</p> <p>The water within the Storage Dam and Settling Pond are both used as firewater sources for the mine, therefore its reliability and effectiveness is considered during the control adequacy assessment.</p>	Rejected
		RR-CA-00686	Contamination of Traralgon or Sheepwash Creek with chemical or toxin (malicious act)	<p>Malicious act within the mine site leaving the mine (eco-terrorism). This event is not considered credible as contamination of the creeks is not achievable and are not considered to be a valued target. Therefore this cause is rejected.</p>	Rejected
RR-R-00061	Impact to water (Level 1/2)	RR-CA-00590	Abandoned geophysical probe Y4733 on northern batters potentially impacting groundwater	<p>Probe is broken and unable to be retrieved at depth of 200 m. Bore is sealed and encapsulated in grout.</p> <p>The probe is a radioactive source, however, the Department of Health has reviewed the impacts to both land and public health and considered the impacts to be insignificant. Therefore, this cause is rejected.</p>	Rejected

Risk Scenario Rejected Causes



Risk Code	Top Event	Cause Code	Cause Name	Comments	Status
RR-R-00061	Impact to water (Level 1/2)	RR-CA-00509	Degraded water quality due to blue green algae outbreak in the three OB runoff ponds and Fire Service Pond.	Blue green algae outbreak is not expected in the three OB runoff ponds and Fire Service Pond, as they are typically acidic (low pH). Therefore, this cause is rejected. Other ponds include Settling Pond, Ash Pond and High Level Storage Dam. The Settling Pond, Ash Pond and High Level Storage Dam are located outside of the mine lease area, therefore they are assessed to be outside the scope of the Mine Risk Assessment and Management Plan.	Rejected
RR-R-00074	Gas pipelines fire/explosion	RR-CA-00622	Damage to natural gas line to Loy Yang B due to ground movement	Mining related activities does not create longitudinal strain on the pipeline. Therefore, this is not considered to be a credible cause of a loss of containment.	Rejected
RR-R-00068	Fugitive dust emissions	RR-CA-00717	Smoke from small fire within the mine operations, general burn off or hotspot (steam/smoke)	Although these causes have the potential to generate some noticeable smoke, the amount of smoke generated is expected to be minor. Therefore, the amenities and/or public health impact is considered to be below level of concerns. Hence this cause is rejected.	Rejected
RR-R-00065	Impact to land (Level 1/2)	RR-CA-00628	Damage to potable water services to parts of Traralgon due to ground movement from mining activities	Potential pathways include: - aquifer depressurisation - mining activity Failure on the pipeline may affect potable water supply to some parts of Traralgon. This may result in disruption to services and is considered not to be a risk to public safety or environment. Therefore, this is assessed as outside the Mine Risk Management Plan.	Rejected
		RR-CA-00583	Localised subsidence due to areas of fire leaving burnt out voids	This hazard may result in localised/limited unstable areas within the mine void. There is a potential exposure to external fire fighters. The risk associated with this is considered in RR-R-00073. As this event is not expected to result in any environmental impacts, this cause is rejected.	Rejected

Risk Scenario Rejected Causes



Risk Code	Top Event	Cause Code	Cause Name	Comments	Status
RR-R-00066	Impact to land (Level 3)	RR-CA-00632	OB run off pond wall failure due to ground movement as a result of mining activities	Strain on the wall structure coupled with elevated hydraulic loading. The amount of ground movement as a result of mining activity is expected to be uniform/regular and at a magnitude less than normal loading of the OB run off pond wall structure. Therefore, this is not considered to be a credible cause of wall failure. Hence, this cause is rejected.	Rejected
RR-R-00067	Impact to land (Level 4/5)	RR-CA-00592	High Level Storage Dam, Ash Pond and Fire Services Pond wall failure due to ground movement as a result of mining activities	The localised mining induced ground strains are not of sufficient magnitude to impact the structural integrity of the High Level Storage Dam, Ash Pond and Fire Services Pond. Therefore, this cause is rejected.	Rejected
		RR-CA-00591	Settling Pond, Ash Pond and High Level Storage Dam wall failure due to seismic event or extreme rainfall	The Settling Pond, Ash Pond and High Level storage Dam are located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.	Rejected
RR-R-00075	Criminal act	RR-CA-00732	Contamination of Traralgon or Sheepwash Creek with chemical or toxin (malicious act).	This cause is addressed in RR-R00063. Therefore, this cause is not included on this bowtie.	Rejected
		RR-CA-00695	Criminal intent to damage a single block batter or wall movement	It is not considered a credible event for a person whose intent is to take action to compromise the integrity of the mine relating to batters and walls is conceived possible, as this would not result in damage to AGL of concern. Therefore, this cause is rejected.	Rejected

Risk Scenario Rejected Causes



Risk Code	Top Event	Cause Code	Cause Name	Comments	Status
RR-R-00075	Criminal act	RR-CA-00689	Criminal intent to damage the integrity of the High Level Storage Dam, Settling Pond, OB dam or Fire Services Pond Dam	<p>This causes includes a criminal act with intent to damage the integrity of various dams/ponds resulting in a dam wall failure.</p> <p>The High Level Storage Dam and Settling Pond are located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore, these have not been considered in this assessment.</p> <p>It is not considered credible that a person wishing to do harm would take action to compromise the integrity of the dam wall of the OB dam or the Fire Services pond, as this would not result in damage of concern to AGL. It is also considered that the dam is not an attractive target and there is no motivation or capability to breach a dam wall. Therefore, this cause is rejected.</p> <p>Ground movement causes that have the potential to damage the integrity of the OB Dam or Fire Services Pond have been addressed in RR-R00066.</p>	Rejected
		RR-CA-00688	Criminal intent to initiate an arson attack	<p>This cause is addressed in RR-R00073. Therefore, this cause is not included on this bowtie.</p>	Rejected

APPENDIX G – ALL DETAIL REPORT

This appendix includes the detailed report which contains all the data and assumptions underlying the risk assessment. Information included in this report includes comments that were captured in the workshop that relate to:

- The likelihood assessment for each cause;
- The existing controls for each cause;
- The adequacy assessment for each control, i.e. overall effectiveness as a function of effectiveness and applicability;
- Recommended additional controls or recommendation to improve existing controls;
- The rejected causes and reasoning for rejecting the causes;
- Consequence impacts for each outcome including potential receptors; and
- The risk of each impact.

The report is contained within pages 159 to 313.



Risk Scenario Details

Status Active

Top Event **Impact to water (Level 1/2)**

Scenario **Mining operations which could cause Level 1/2 impact to the environment (water)**

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current	Possible (3)		Environment & Community		Level 2 (1.0)			Moderate	
Proposed	Possible (3)		Environment & Community		Level 2 (1.0)			Moderate	

Causes

Cause	Description	Code	Status	Current	Likelihood	Contribution
	Contaminated water runoff from the OB dump due to excessive rainfall	RR-CA-00503	Active		Rare (1)	0.1%
				Proposed	Rare (1)	0.1%

Comments A high rainfall event may result in the currently installed system capacity being exceeded with the potential to breach the EPA discharge licence.

The likelihood of this event occurring considered the drainage system in place, which contains retention ponds and flow regulation (up to 1 in 2 yr storm events), is considered to be RARE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02221	BC-00419	Containment of mine drainage within the Mine Lease Area	No Owner Defined	In Service	100.0%	Critical Control	Engineering	6-Oct-2015	Good

Base Control Comments Drainage system contains retention ponds and flow regulation (up to 1 in 2 year storm events).

The base control is assessed via the following:

- Implemented: Yes
- Type: Engineering
- Reliability: Good
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Containment of mine drainage (retention ponds) within the Mine Lease Area

Risk Control Comments The retention ponds are used to expose the acidic drainage to sunlight which provides a mechanism for acids to break down.

Drainage system contains retention ponds and flow regulation for normal flows including minor storm events.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03039	BC-00405	Water Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Inputs from the hydrological model and monitoring for the overburden dump runoff form the basis of the Water Treatment System.

The system includes the following water treatment:
 - caustic addition for pH adjustment
 - cationic polymer for turbidity
 - indirectly 10% of total dissolved solids removed with the dosing, 20% reduced by mixing with power station water

The system alarms on the operating level and pH of incoming water.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative/Engineering
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Water Treatment System

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: Low (Control applicability has been incorporated in determining the likelihood of this event)
 - Applicable: High

Based on the above, no applicability is assigned as the control has been incorporated in the likelihood of this event.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00020	Finalise the Water Management Plan and associated TARPs (including OB & Settling Pond systems).		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Contamination of surface discharge due to failure of oil separation system	RR-CA-00505	Active	Possible (3)	8.2%
			Proposed	Possible (3)
				8.2%

Comments There are four oil separation units, two (RTL and Veolia Workshops) located within the mine lease area and two (Loy Yang A power station and the MSS Fire Station) outside the Mine Lease Area.

In the event of a failure of the oil separation units within the Mine Lease Area, all discharges will be contained within the mine. The likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00061



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03040	BC-00447	Settling Pond Oil in Drain	No Owner Defined	In Service	100.0%	Non-Critical Control	Administrative	13-Oct-2015	Good
Base Control Comments	Main drainage oil detection, alarm and operator response (prior to settling pond).									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative/Engineering									
	- Reliability: Good									
	- Monitoring/Auditing: Performance monitoring									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Main drainage oil detection, alarm and operator response (prior to settling pond)									
Risk Control Comments	The risk control is assessed via the following factors:									
	- Independence: High									
	- Applicable: Mod-High									
	Based on the above, full applicability is assigned.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03041	BC-00419	Containment of mine drainage within the Mine Lease Area	No Owner Defined	In Service	0.0%	Critical Control	Engineering	6-Oct-2015	Good
Base Control Comments	Drainage system contains retention ponds and flow regulation (up to 1 in 2 year storm events).									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Engineering									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-Hoc									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Oil containment booms on settling pond									
Risk Control Comments	The retention ponds are used to expose the acidic drainage to sunlight which provides a mechanism for acids to break down.									
	Drainage system contains retention ponds and flow regulation for normal flows including minor storm events.									
	The risk control is assessed via the following factors:									
	- Independence: Low (part of main drainage oil detection, alarm and operator response control); hence not independent									
	- Applicable: Mod-high									
	Based on the above, no applicability is assigned as control is part of the main drainage oil detection alarm and operator response control.									

Cause	Code	Status	Likelihood	Contribution
Generation of acid mine water runoff from exposed large areas of interseam in open cut and internal OB dump	RR-CA-00507	Active	Current Possible (3)	8.2%
			Proposed Possible (3)	8.2%
Comments	Mine water can become acidified if large areas of interseam are left exposed in open cut. This is currently managed through the mine operations treating the mine water. However, once mine activities ceased, there is a potential of untreated water being discharged from these uncapped areas. This hazard has been included in RR-R-00071.			
	The likelihood of this event is considered to be POSSIBLE.			

Active Risk Scenarios ID: RR-R-00061



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02243	BC-00448	Operating procedure - lime addition	No Owner Defined	In Service	100.0%	Non-Critical Control	Procedural	6-Oct-2015	Assessed	
Base Control Comments	The base control is assessed via the following: - Implemented: Part - Type: Behavioural - Reliability: Fair - Monitoring/Auditing: None Based on the above, the effectiveness is assessed to be ASSESSED.										
Risk Control Context	Operating procedure to adjust pH										
Risk Control Comments	The risk control is assessed via the following factors: - Independence: High - Applicable: Mod-High Based on the above, full applicability is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00025	Formalise the activity of lime dosing (pH correction) at the base of the mine.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02612	BC-00419	Containment of mine drainage within the Mine Lease Area	No Owner Defined	In Service	100.0%	Critical Control	Engineering	7-Oct-2015	Good
Base Control Comments	Drainage system contains retention ponds and flow regulation (up to 1 in 2 year storm events). The base control is assessed via the following: - Implemented: Yes - Type: Engineering - Reliability: Good - Monitoring/Auditing: Ad-Hoc Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Containment of mine drainage (based in the mine) within the Mine Lease Area									
Risk Control Comments	The retention ponds are used to expose the acidic drainage to sunlight which provides a mechanism for acids to break down. Drainage system contains retention ponds and flow regulation for normal flows including minor storm events. The risk control is assessed via the following factors: - Independence: High - Applicable: Mod-High Based on the above, full applicability is assigned.									

Cause	Code	Status	Likelihood	Contribution
Contaminated water from Latrobe City Council new landfill site leachate dam discharged onto AGL property	RR-CA-00508	Active	Current	Rare (1) 0.8%
			Proposed	Rare (1) 0.8%
Comments	The Latrobe City Council new landfill site is located outside of the mine lease area and any potential surface discharge from the site is not expected to enter the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.			

Cause	Code	Status
Degraded water quality due to blue green algae outbreak in the three OB runoff ponds and Fire Service Pond.	RR-CA-00509	Rejected



Comments Blue green algae outbreak is not expected in the three OB runoff ponds and Fire Service Pond, as they are typically acidic (low pH). Therefore, this cause is rejected.

Other ponds include Settling Pond, Ash Pond and High Level Storage Dam. The Settling Pond, Ash Pond and High Level Storage Dam are located outside of the mine lease area, therefore they are assessed to be outside the scope of the Mine Risk Assessment and Management Plan.

Cause	Code	Status	Likelihood	Contribution	
PCB spill from transformers	RR-CA-00521	Active	Current	Unlikely (2)	0.8%
			Proposed	Unlikely (2)	0.8%

Comments Potential pathways include:
 - general maintenance failure
 - failure
 - equipment deterioration

The likelihood of this event is considered to be UNLIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02613	BC-00420	Transformer Maintenance Program	No Owner Defined	In Service	100.0%	Non-Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Oil sampling on transformers scheduled through Asset Suite
 Annual based on condition of equipment

Risk Control Comments The risk control is assessed via the following factors:
 - Independence: High
 - Applicable: Mod-High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02614	BC-00421	PCB Register allows tracking of spill/leak from transformer	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	7-Oct-2015	Average

Base Control Comments The control includes a list of equipment that contain PCB. This allows the tracking when issues occur, i.e. leak, faults etc

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context PCB Register allows tracking of a spill/leak from transformer

Risk Control Comments The risk control is assessed via the following factors:
 - Independence: Low (not independent; part of the Transformer Maintenance Program.
 - Applicable: Mod

Based on the above, no applicability is assigned, as this is part of the Transformer Maintenance Program.

Cause	Code	Status	Likelihood	Contribution	
Contaminated water from Latrobe City Council old landfill site leachate dam discharged onto AGL property	RR-CA-00525	Active	Current	Possible (3)	81.9%
			Proposed	Possible (3)	81.9%



Comments The leachate pond for the old landfill site is located within the mine lease area. The potential discharge within that pond is within the Mine Lease Area.

The leachate pond and associated old landfill site of Latrobe City Council should operate within the site's EPA licence. They are not actively managing the old landfill site. Therefore, the likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02285	BC-00454	Land Management Lease Agreements	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	6-Oct-2015	Assessed

Base Control Comments Land management and monitoring requirements described in the lease agreement.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: None

Based on the above, the effectiveness of the control is assessed to be ASSESSED.

Risk Control Context Land management and monitoring requirements described in the lease agreement

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned.

Cause	Description	Code	Status
	Abandoned geophysical probe Y4733 on northern batters potentially impacting groundwater	RR-CA-00590	Rejected

Comments Probe is broken and unable to be retrieved at depth of 200 m. Bore is sealed and encapsulated in grout.

The probe is a radioactive source, however, the Department of Health has reviewed the impacts to both land and public health and considered the impacts to be insignificant. Therefore, this cause is rejected.

Consequences

Consequence	Description	Code	Category	Likelihood	Severity	Risk Rating
	Contaminated water discharge with the potential to impact the environment	RR-CQ-00433	Environment & Community	Current	Possible (3) Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community.	Moderate
				Proposed	Possible (3) Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community.	Moderate

Active Risk Scenarios ID: RR-R-00061



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03083	BC-00409	Monitoring equipment L171, alarm and operator response	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	<p>The equipment continuously monitor pH, turbidity, temperature and conductivity.</p> <p>Operator periodically monitors the systems and responds to alarms.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed as GOOD.</p>										
Risk Control Context	Alarm and operator response										
Risk Control Comments	<p>Although this is a separate system to the Water Treatment System, there is a potential for common cause failure.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (Not independent of the Water Treatment System control). - Applicable: High <p>Based on the above, no applicability is assigned as this is not fully independent of the Water Treatment System, i.e. shares similar hardware.</p>										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03084	BC-00410	Weekly sampling at discharge point L171 and L160	No Owner Defined	In Service	100.0%	Non-Critical Control		7-Oct-2015	Assessed
Base Control Comments	<p>Third party sampling analysis of monitoring equipment L160 and L171 on a weekly basis. This control provides assurance that the system is functioning.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be ASSESSED.</p>									
Risk Control Context	Independent third party sampling									
Risk Control Comments	<p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: High - Applicable: High <p>Based on the above, full applicability is assigned.</p>									



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03085	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Emergency Response Procedure
Context

Risk Control Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.
Comments

The risk control is assessed via the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Impact to water (Level 3)**

Scenario **Mining operations which could cause Level 3 impact to the environment (water)**

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current		Rare (1)		Environment & Community	Level 3 (1.5)			Low	
Proposed		Rare (1)		Environment & Community	Level 3 (1.5)			Low	

Causes

Cause	Description	Code	Status
	Power station plant failure resulting in discharge of water with high conductivity levels to the Settling Pond	RR-CA-00482	Rejected

Comments

Potential pathways include:

- plant failure; pumps valves etc.
- management of clinker "trash pit" to minimise the likelihood of blockages

The Settling Pond is located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.

Cause	Description	Code	Status
	Water migration from the Ash Pond	RR-CA-00483	Rejected

Comments

Power station discharging saline water and ash into the Ash Pond resulting in a potential of contaminated groundwater migrating beyond the attenuation zone boundary.

The Power Station activity and Ash Pond are located outside of the mine lease area, therefore they are assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.

Cause	Description	Code	Status	Likelihood	Contribution
	Contaminated water due to a failure of Dredge Ash holding cell	RR-CA-00601	Active	Current: Unlikely (2)	4.9%
				Proposed: Unlikely (2)	4.9%

Comments

Potential pathways include:

- piping failure (related to the performance of the clay liner and seepage)
- overtopping (erosion of the capping and liner)
- instability of the storage (movement)

A geotechnical failure of the cell wall may result in discharge of saline water to the external environment. Ash spill is expected to be contained within the Mine Lease Area. However, water discharge may extend beyond the Mine Lease Area.

The system is geotechnically designed for void and constructed (QA Plan) to ANCOLD guidelines (GHD report – Ash Void 31/11466/14/Z32965). The holding cell was designed and built in accordance with the relevant standards and practices. Based on the above, the likelihood of this event is considered to be UNLIKELY.

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02485	BC-00412	Ash Trial Environmental Improvement Plan	No Owner Defined	Proposed	0.0%	Non-Critical Control	Procedural	7-Oct-2015	Assessed

Base Control Comments This is the approval plan recognised by the EPA.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: None

Based on the above, the effectiveness of the control is assessed to be ASSESSED.

Risk Control Context EPA Approval process

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned considering the effectiveness of the base control and applicability of the risk control. Therefore, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03032	BC-00415	Operational Monitoring Program for the dredging activity	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments This activity involves observational inspection and sets the operational control for water balance. It provides an opportunity to suspend operation when operating limits are exceeded.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Observational inspection and water balance

Risk Control Comments The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03033	BC-00414	Groundwater Monitoring Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Average

Base Control Comments This includes consideration for environmental issues with regards to groundwater interactions as well as geotechnical stability.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed as AVERAGE.

Risk Control Context Groundwater Monitoring Plan

Risk Control Comments The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03034	BC-00413	Dam monitoring program	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Program specifies the monitoring program associated with dams and how they are to be built.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Ash void monitoring program

Risk Control Comments Construction and QA Plan for void design and constructed to ANCOLD guidelines. Geotechnically designed (GHD report – Ash Void)

The risk control is assessed via the following factors:

- Independence: Mod
- Applicable: Mod-High

Based on the above, partial applicability is assigned.

Cause	Description	Code	Status	Likelihood	Contribution
	Disruption of flow to Sheepwash Creek due to failure of retention basin	RR-CA-00629	Active	Current	Rare (1) 45.3%
				Proposed	Rare (1) 45.3%

Comments Possible pathways include:

- Significant ground movements,
- Strains, subsidence
- Major mine batter instability.

This could result in an uncontrolled waterflow to the mine which will be contained within the Mine Lease Area. There is a potential for disruption of flow to the Sheepwash Creek, however, this is considered to have no environmental (water quality, quantity and biodiversity) impact offsite to Sheepwash Creek.

This event requires multiple failures to occur simultaneously to impact Sheepwash Creek offsite. Therefore, the likelihood of this event is considered to be RARE.

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03036		Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.	No Owner Defined	Proposed	100.0%	Non-Critical Control	13-Oct-2015	Assessed

Risk Control Context
 Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.

Risk Control Comments
 The implementation of this recommendation will provide ongoing assurance that the asset will be maintained to the appropriate guidelines. Therefore, no risk reduction is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.		Normal		Pending		N/A

Cause	Description	Code	Status	Likelihood	Contribution
	Settling Pond wall failure due to ground movement as a result of mining activities	RR-CA-00714	Active	Unlikely (2)	4.5%
				Proposed	4.5%

Comments
 Historically, there has known to be exposed coal under the pond that has resulted in cracks being a conduit for leaks. In the event of a significant ground movement, there is a potential for the integrity of the dam wall to be compromised. This may result in a significant loss of containment of material within the Settling Pond.

The likelihood of this event is considered to be UNLIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03021	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
 TARPs will trigger actions to mitigate the events of ground movement.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
 Emergency Management Plan and TARPs

Risk Control Comments
 The risk control is assessed based on the following factors:
 - Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03022	BC-00443	Inspection, monitoring and maintenance of the Settling Pond	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Program for the inspection, monitoring and maintenance of the Settling Pond.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Inspection, monitoring and maintenance of the Settling Pond

Risk Control Comments The risk control is assessed based on the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Cause		Code	Status		Likelihood	Contribution
	Contaminated water discharge (quality & quantity) due to site based activities	RR-CA-00723	Active	Current	Unlikely (2)	45.3%
				Proposed	Unlikely (2)	45.3%

Comments Potential loss of biodiversity (flora & fauna) due to altered water discharge (quality & quantity) from site based activities.

Potential pathways include:

- acid wastewater (pH)
- contaminated water leaving site from a hydrocarbon spill
- adverse colour
- high turbidity due to ineffective OB run-off treatment system
- suspended solids
- total dissolved solids
- flowrate (high rainfall/flood)
- reduced flowrate during drought conditions
- high temperature water

The likelihood of this event considered with the Water Treatment System control in place extending beyond the Mine Lease Area, is considered to be UNLIKELY.

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-03074	BC-00405	Water Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	Inputs from the hydrological model and monitoring for the overburden dump runoff form the basis of the Water Treatment System. The system includes the following water treatment: - caustic addition for pH adjustment - cationic polymer for turbidity - indirectly 10% of total dissolved solids removed with the dosing, 20% reduced by mixing with power station water The system alarms on the operating level and pH of incoming water. The base control is assessed via the following: - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness is assessed to be GOOD.										
Risk Control Context	Water Treatment System										
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: Low (Control applicability has been incorporated in determining the likelihood of this event) - Applicable: High Based on the above, no applicability is assigned as the control has been incorporated in the likelihood of this event.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00020	Finalise the Water Management Plan and associated TARPs (including OB & Settling Pond systems).					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03075	BC-00419	Containment of mine drainage within the Mine Lease Area	No Owner Defined	In Service	100.0%	Critical Control	Engineering	6-Oct-2015	Good
Base Control Comments	Drainage system contains retention ponds and flow regulation (up to 1 in 2 year storm events). The base control is assessed via the following: - Implemented: Yes - Type: Engineering - Reliability: Good - Monitoring/Auditing: Ad-Hoc Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Containment of mine drainage (retention ponds) within the Mine Lease Area									
Risk Control Comments	The retention ponds are used to expose the acidic drainage to sunlight which provides a mechanism for acids to break down. Drainage system contains retention ponds and flow regulation for normal flows including minor storm events. The risk control is assessed via the following factors: - Independence: High - Applicable: Mod-High Based on the above, full applicability is assigned.									

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Contaminated water discharge with the potential to impact the environment					



RR-CQ-00413	Environment & Community	Current	Rare (1)	Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low
		Proposed	Rare (1)	Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03037	BC-00409	Monitoring equipment L171, alarm and operator response	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	<p>The equipment continuously monitor pH, turbidity, temperature and conductivity.</p> <p>Operator periodically monitors the systems and responds to alarms.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed as GOOD.</p>										
Risk Control Context	Alarm and operator response										
Risk Control Comments	<p>Although this is a separate system to the Water Treatment System, there is a potential for common cause failure.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate (Not independent of the Water Treatment System control). - Applicable: High <p>Based on the above, partial applicability is assigned as it is not fully independent of the Water Treatment System, i.e. shares similar hardware.</p>										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).					Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03038	BC-00410	Weekly sampling at discharge point L171 and L160	No Owner Defined	In Service	100.0%	Non-Critical Control		7-Oct-2015	Assessed
Base Control Comments	Third party sampling analysis of monitoring equipment L160 and L171 on a weekly basis. This control provides assurance that the system is functioning.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be ASSESSED.									
Risk Control Context	Independent third party sampling									
Risk Control Comments	The risk control is assessed via the following factors:									
	- Independence: High									
	- Applicable: High									
	Based on the above, full applicability is assigned.									

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Loss in biodiversity: vegetation, habitat destruction, threatened species	RR-CQ-00553	Environment & Community	Current	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low
			Proposed	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03077	BC-00410	Weekly sampling at discharge point L171 and L160	No Owner Defined	In Service	100.0%	Non-Critical Control		7-Oct-2015	Assessed
Base Control Comments	Third party sampling analysis of monitoring equipment L160 and L171 on a weekly basis. This control provides assurance that the system is functioning.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be ASSESSED.									
Risk Control Context	Independent third party sampling									
Risk Control Comments	The risk control is assessed via the following factors:									
	- Independence: High									
	- Applicable: High									
	Based on the above, full applicability is assigned.									



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03078	BC-00409	Monitoring equipment L171, alarm and operator response	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control
Comments The equipment continuously monitor pH, turbidity, temperature and conductivity.

Operator periodically monitors the systems and responds to alarms.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative/Engineering
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed as GOOD.

Risk Control
Context Alarm and operator response

Risk Control
Comments Although this is a separate system to the Water Treatment System, there is a potential for common cause failure. Monitoring can detect lower water flows.

The risk control is assessed via the following factors:

- Independence: Moderate (Not independent of the Water Treatment System control).
- Applicable: High

Based on the above, partial applicability is assigned as it is not fully independent of the Water Treatment System, i.e. shares similar hardware.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).		Normal		Pending		N/A

Consequence	Loss of water usage downstream	Code	Category	Likelihood	Severity	Risk Rating
		RR-CQ-00554	Public Safety	Current	Rare (1) Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours)	Low
				Proposed	Rare (1) Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours)	Low

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03079	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control Comments The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedure

Risk Control Comments Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.

The risk control is assessed via the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03080	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Community Engagement Plan

Risk Control Comments Engagement of stakeholders within the community is the process to inform/manage community issues.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned.

Active Risk Scenarios ID: RR-R-00062



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03081	BC-00409	Monitoring equipment L171, alarm and operator response	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control The equipment continuously monitor pH, turbidity, temperature and conductivity.

Comments

Operator periodically monitors the systems and responds to alarms.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative/Engineering
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed as GOOD.

Risk Control Alarm and operator response

Context

Risk Control Although this is a separate system to the Water Treatment System, there is a potential for common cause failure. Monitoring can detect lower water flows.

Comments

The risk control is assessed via the following factors:

- Independence: Moderate (Not independent of the Water Treatment System control).
- Applicable: High

Based on the above, partial applicability is assigned as it is not fully independent of the Water Treatment System, i.e. shares similar hardware.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).		Normal		Pending		N/A



Risk Scenario Details

Status Active

Top Event **Impact to water (Level 4)**

Scenario **Mining operations which could cause Level 4 impact to the environment (water)**

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current		Unlikely (2)		Environment & Community		Level 4 (4)		Moderate	
Proposed		Likely (4)		Environment & Community		Level 4 (4)		High	

Causes

Cause	Description	Code	Status	Contribution	Likelihood
	Acid mine drainage from the overburden dump impacting Traralgon Creek water quality	RR-CA-00487	Active	76.7%	Unlikely (2)
				1.0%	Unlikely (2)

Comments Potential pathways include:
 - exposed sulphites within excavated material to rainwater, groundwater and surface water
 - oxidation in the presence of air (within overdump and when exposed to air) and water acts as the transportation medium
 The likelihood of this event, with the Water Treatment System control in place, is considered to be UNLIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02607	BC-00405	Water Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Inputs from the hydrological model and monitoring for the overburden dump runoff form the basis of the Water Treatment System.

- The system includes the following water treatment
- caustic addition for pH adjustment
 - cationic polymer for turbidity
 - indirectly 10% of total dissolved solids removed with the dosing, 20% reduced by mixing with power station water

The system alarms on the operating level and pH of incoming water.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative/Engineering
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Water Treatment System

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: Low (Control applicability has been incorporated in determining the likelihood of this event)
 - Applicable: High

Based on the above, no applicability is assigned as the control has been incorporated in the likelihood of this event.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00020	Finalise the Water Management Plan and associated TARPs (including OB & Settling Pond systems).		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03004	BC-00408	Environmental site plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments
 The plan specifies the allowable discharge limits as referenced in the EPA licence 11149 conditions.
 This includes ongoing visual inspection and remediation of targeted areas following the hydrological model and monitoring.
 The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Fair
 - Monitoring/Auditing: None
 Based on the above, the effectiveness is assessed to be AVERAGE.

Risk Control Context
 Ongoing Rehabilitation and Seepage Program

Risk Control Comments
 This control directly remediates the area of concern.
 The risk control is assessed based on the following factors:
 - Independence: Moderate
 - Applicable: Mod-High
 Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03005	BC-00418	Hydrological model for the overburden dump runoff	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	7-Oct-2015	Average

Base Control Comments
 This control assesses the runoff and hydrology of the overburden dump. It provides information allowing identification and response on targeted areas preventing acidification. This is conducted once every 5 years.
 The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Fair
 - Monitoring/Auditing: None
 Based on the above, the effectiveness is assessed to be AVERAGE.

Risk Control Context
 Hydrological model for the overburden dump runoff

Risk Control Comments
 Hydrological model and monitoring for the overburden dump runoff
 The risk control is assessed based on the following factors:
 - Independence: Low
 - Applicable: Moderate
 The program sets the basis for the implementation of other systems and procedures to manage acid mine drainage.
 Based on the above, no applicability is assigned.

Cause	Code	Status
Additional water flow down Traralgon Creek due to High Level Storage Dam or Settling Pond wall failure	RR-CA-00490	Rejected



Comments Possible pathways include:

- dam wall collapse (deterioration of dam structure)
- seismic event
- piping failure/erosion etc

These pathways may result in additional water flow down Traralgon Creek.

The High Level Storage Dam and Settling Pond are located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.

The water within the Storage Dam and Settling Pond are both used as firewater sources for the mine, therefore its reliability and effectiveness is considered during the control adequacy assessment.

Cause	Contamination of Traralgon or Sheepwash Creek with chemical or toxin (malicious act)	Code	Status
		RR-CA-00686	Rejected
Comments	Malicious act within the mine site leaving the mine (eco-terrorism). This event is not considered credible as contamination of the creeks is not achievable and are not considered to be a valued target. Therefore this cause is rejected.		

Cause	Change in creek bed grade and flood plains due to land subsidence as a ground failure	Code	Status		Likelihood	Contribution
		RR-CA-00710	Active	Current	Possible (3)	8.0%
				Proposed	Possible (3)	0.0%

Comments There is a potential for this cause to result in local inundation and environmental impacts (substrate of the stream bed), which includes potential loss of biodiversity (flora & fauna).

Ground failure as a result of:

- seismic event
- high rainfall
- mining activities
- aquifer depressurisation
- geotechnical failure

There is an uncontrolled discharge of surface water into the mine from external catchments resulting in a loss of flow downstream.

These activities could potentially trigger horizontal ground strain which could result in cracking and creek water recharge of coal joints. Reduction in flow may affect biodiversity downstream.

The likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-03006	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	<p>GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group.</p> <p>Stability analysis and batter design, ground movement modelling (predictions).</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>										
Risk Control Context	Subsidence modelling and monitoring										
Risk Control Comments	<p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Moderate <p>Partial applicability is assigned as subsidence modelling and monitoring assists in the process of identifying the hazard.</p>										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03007	BC-00426	LV Regional Groundwater Management Plan	No Owner Defined	In Service	31.0%	Non-Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>The modelling and monitoring reports are provided to Southern Rural Water. AGL Loy Yang provide information for input into the regional subsidence modelling and monitoring. They enable predictive modelling of subsidence which form the basis of the amount of groundwater removal. This ensures that overall subsidence is monitored.</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implemented: Yes - Control type: Administrative - Reliability rating: Fair - Monitoring/Auditing: Ad-hoc <p>The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.</p> <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Regional coordination modelling and monitoring of subsidence									
Risk Control Comments	<p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (Not independent of subsidence modelling and monitoring control) - Applicable: Moderate <p>The output from this control is combined with the subsidence modelling and monitoring control. Based on the above, partial applicability is assigned.</p>									

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03008	BC-00425	Aquifer Depressurisation Annual Report	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
 This annual report specifies the volumes of artesian dewatering required to maintain mine stability.

This is considered a critical activity for mine stability. It is a mature and established process. It is essential in maintaining safe operations within the mine. The process is monitored and reviewed. There is also an external audit required within the process.

The base control is assessed via the following factors:
 - Implementation: Yes
 - Control type: Administrative
 - Reliability rating: Very Good
 - Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
 Optimisation of groundwater extraction to minimise subsidence effects

Risk Control Comments
 Only the required amount of groundwater is extracted to maintain mine stability.

The risk control is assessed based on the following factors:
 - Independence: High
 - Applicable: Mod-High

The implementation of the action associated with the base control is expected to increase the overall effectiveness of the control.

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03009	BC-00426	LV Regional Groundwater Management Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	5-Oct-2015	Good

Base Control Comments
 The modelling and monitoring reports are provided to Southern Rural Water. AGL Loy Yang provide information for input into the regional subsidence modelling and monitoring. They enable predictive modelling of subsidence which form the basis of the amount of groundwater removal. This ensures that overall subsidence is monitored.

The base control is assessed via the following factors:
 - Implemented: Yes
 - Control type: Administrative
 - Reliability rating: Fair
 - Monitoring/Auditing: Ad-hoc

The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
 Regional and third party monitoring (every 5 years) reported to DEDJTR and Southern Rural Water

Risk Control Comments
 Condition of Extraction licence (#2007440)

The risk control is assessed based on the following factors:
 Independence: Mod
 Applicable: Low (no effect to reduce likelihood of cause; control function is to model and monitor subsidence.

Based on the above, no applicability is assigned.

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment		
	RR-COP-03010		Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.	No Owner Defined	Proposed	100.0%	Non-Critical Control	12-Oct-2015	Good		
Risk Control Context	Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.										
Risk Control Comments	The implementation of this action is expected to reduce the likelihood of this hazard by one order. Therefore one order of future risk reduction is assigned to this action.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00021	Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.					Normal		Pending		N/A

Cause	Planned Traralgon Bypass and associated development to impact surface water and mine stability	Code	Status	Likelihood	Contribution
		RR-CA-00711	Active	Rare (1)	7.7%
				Likely (4)	98.9%
Comments	<p>The planned Traralgon Bypass development has the potential to impact surface water, potentially impacting the mine stability, which will have an impact to the overall area, including the bypass and associated infrastructure.</p> <p>A recent committee forum held by the West Gippsland Catchment Authority indicated that the authority plans to implement flood protection for Traralgon would result in surface water being stored on the Western Batters. This concept is expected to present a significant risk to the Western Batters which could result in changing of the Traralgon Creek bed. Therefore, without AGL's involvement in the planned Traralgon Bypass project, it is considered that ground movement is LIKELY. (This is a potential future risk only).</p>				

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment		
	RR-COP-03011		AGL to engage with the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.	No Owner Defined	Proposed	100.0%	Non-Critical Control	12-Oct-2015	Assessed		
Risk Control Context	AGL to engage with the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.										
Risk Control Comments	<p>Learnings from the Morwell main drain project should be considered as part of this process.</p> <p>The action is expected to reduce the likelihood of this event, however, it is highly dependent on the external party (authorities) understanding the risk and implementing actions to prevent/mitigate the event. Therefore, no risk reduction is assigned to this action.</p>										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00054	AGL should engage the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.					Normal		Pending		N/A

Cause	Subsidence due to coal block sliding impacting Traralgon Creek.	Code	Status	Likelihood	Contribution
		RR-CA-00713	Active	Likely (4)	7.7%
				Likely (4)	0.1%
Comments	<p>Coal block sliding (mine permanent western batters) has the potential to impact Traralgon Creek.</p> <p>Potential pathways include:</p> <ul style="list-style-type: none"> - Water levels elevated (ponded water bodies, inflow source, etc.), - strain-softening (progressive weakening), progressive failure, - creep movements, - low shear-strength interseam and / or - coal contact, - structural complexities (eg: continuous and unfavourably oriented fault / interconnecting structures), - water ingress due to erosion and piping, and - water ingress from settling pond (failure of liner) <p>The likelihood of this event is considered to be LIKELY.</p>				

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03017	BC-00441	Geotechnical Inspections and TARPS	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Based on the results of the inspection, further activities are undertaken as required, which may include pin monitoring. Carry out mine inspections following significant rainfall events (consistent with TARP) or other defined trigger events including ground movement episodes and seismic events. Key stability monitoring bores have been identified and are monitored at regular intervals and in association with trigger rainfall events.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Geotechnical Inspections and TARPS

Risk Control Comments The risk control is assessed based on the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03018	BC-00439	Surface drainage inspection and maintenance	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Surface drainage maintenance (including clay capping) to minimise surface water inflows to coal joints, horizontal drains (monitoring and maintenance), regular stability assessment and modelling using current groundwater levels (TARP).

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed as GOOD.

Risk Control Context Surface drainage inspection and maintenance

Risk Control Comments The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: High

Based on the above, full applicability is assigned.

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03019	BC-00440	Subsurface (horizontal drains) drainage inspection and maintenance	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Although drains are considered to be an engineering control, they could be blocked (restriction in flow) if not appropriately maintained, therefore, it is considered to be an administrative type control. The control is regularly monitored and there is annual inspection.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Subsurface (horizontal drains) drainage inspection and maintenance

Risk Control Comments Surface drainage maintenance (including clay capping) to minimise surface water inflows to coal joints, horizontal drains (monitoring and maintenance), regular stability assessment and modelling using current groundwater levels (TARP).

The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03020	BC-00443	Inspection, monitoring and maintenance of the Settling Pond	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Program for the inspection, monitoring and maintenance of the Settling Pond.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Inspection, monitoring and maintenance of the Settling Pond

Risk Control Comments The risk control is assessed based on the following factors:
Independence: High
Applicable: High

Based on the above, full applicability is assigned.

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Contaminated water discharge with the potential to impact the environment	RR-CQ-00421	Environment & Community	Current	Rare (1) Significant medium term impact on important environment/habitat and/or widespread local community complaints.	Moderate
			Proposed	Rare (1) Significant medium term impact on important environment/habitat and/or widespread local community complaints.	Moderate

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02598	BC-00409	Monitoring equipment L171, alarm and operator response	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>The equipment continuously monitor pH, turbidity, temperature and conductivity.</p> <p>Operator periodically monitors the systems and responds to alarms.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed as GOOD.</p>									
Risk Control Context	Alarm and operator response									
Risk Control Comments	<p>Although this is a separate system to the Water Treatment System, there is a potential for common cause failure.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate (Not independent of the Water Treatment System control). - Applicable: High <p>Based on the above, partial applicability is assigned as it is not fully independent of the Water Treatment System, i.e. shares similar hardware.</p>									
Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking		
	RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).		Normal		Pending		N/A		

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02599	BC-00410	Weekly sampling at discharge point L171 and L160	No Owner Defined	In Service	0.0%	Non-Critical Control		7-Oct-2015	Assessed
Base Control Comments	<p>Third party sampling analysis of monitoring equipment L160 and L171 on a weekly basis. This control provides assurance that the system is functioning.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness of the control is assessed to be ASSESSED.</p>									
Risk Control Context	Independent third party sampling									
Risk Control Comments	<p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: High - Applicable: Low (sampling is undertaken weekly, within this time, a spill may have already occurred). <p>Based on the above, no applicability is assigned.</p>									

Active Risk Scenarios ID: RR-R-00063



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02896	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	9-Oct-2015	Good
Base Control Comments	The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include: - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Emergency Management Plan									
Risk Control Comments	Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller. The risk control is assessed via the following factors: - Independence: Low - Applicable: Low Based on the above, no applicability is assigned.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02897	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	9-Oct-2015	Average
Base Control Comments	Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Fair - Monitoring/Auditing: Ad-Hoc Based on the above, the effectiveness of the control is assessed to be AVERAGE.									
Risk Control Context	Community Engagement Plan									
Risk Control Comments	Engagement of stakeholders within the community is the process to inform/manage community issues. The risk control is assessed via the following factors: - Independence: Moderate - Applicable: Low Based on the above, no applicability is assigned.									

Intermediate Event	Code	Description	Status	Current	Incoming	Outgoing	Probability
	RR-IE-03029	Cause contribution adjustment	Active	Proposed	Unlikely (2) Likely (4)	Rare (1) Unlikely (2)	1.0% 1.0%
Comments	This consequence impact is only in relation to acid mine drainage cause which is UNLIKELY, including preventative controls. Based on this, the incoming likelihood is adjusted to UNLIKELY.						

Consequence	Change in creek grade with the potential to impact the environment	Code	Category	Likelihood	Severity	Risk Rating
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Active Risk Scenarios ID: RR-R-00063



RR-CQ-00549	Environment & Community	Current	Rare (1)	Significant medium term impact on important environment/habitat and/or widespread local community complaints.	Moderate
		Proposed	Unlikely (2)	Significant medium term impact on important environment/habitat and/or widespread local community complaints.	High

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03024	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>TARPs will trigger actions to mitigate the events of ground movement.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Emergency Management Plan and TARPs									
Risk Control Comments	<p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Moderate-High <p>Based on the above, full applicability is assigned.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03026	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Response Procedure									
Risk Control Comments	<p>Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (not independent of Emergency Management Plan and TARPs) - Applicable: Mod-High <p>Based on the above, no applicability is assigned, as not independent of the Emergency Management Plan and TARPs.</p>									



Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03025	Probability of ground movement escalating to consequence	Active	Rare (1)	Rare (1)	50.0%
				Proposed	Unlikely (2)	50.0%
Comments	Once ground movement occurs to the point where the grade of the creek bed is changing, it is difficult to reverse this process. There is a potential for mitigative controls to improve the the creek health and further mitigate the adverse effect of change to the creek. There is also a potential to reduce the magnitude of the impacts. Therefore the likelihood of the event to eventuate to the consequence is considered to be 50%.					



Risk Scenario Details

Status Active

Top Event **Impact to regional aquifers**

Scenario **Sustained changes to the aquifer properties or structures which may impact future users or sensitive receptors**

Ratings Qualitative (Automatically Calculated)

Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current	Unlikely (2)	Environment & Community		Level 3 (1.5)			Moderate	
Proposed	Unlikely (2)	Environment & Community		Level 3 (1.5)			Moderate	

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00027	Investigate the potential impacts of sustained changes to regional aquifer properties or structures to receptors (e.g. future water users or other sensitive receptors) as a result of the depletion of regional aquifers due to the current mining practice where groundwater is extracted to maintain mine stability.		Normal		Pending		N/A

Causes

Cause	Code	Status	Likelihood	Contribution
Cross contamination of regional aquifers from mine floor heave	RR-CA-00598	Active	Unlikely (2)	4.9%
			Unlikely (2)	4.9%

Comments Mining activities may result in the mine floor heave. This has the potential to damage the structure between the aquifers (T1 and MFA).
The likelihood of this event is considered to be UNLIKELY, as depressurisation is required to sustain mine operation.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02469	BC-00425	Aquifer Depressurisation Annual Report	No Owner Defined	In Service	31.0%	Critical Control	Administrative	Reviewed	Good

Base Control This annual report specifies the volumes of artesian dewatering required to maintain mine stability.

Comments This is considered a critical activity for mine stability. It is a mature and established process. It is essential in maintaining safe operations within the mine. The process is monitored and reviewed. There is also an external audit required within the process.

The base control is assessed via the following factors:
 - Implementation: Yes
 - Control type: Administrative
 - Reliability rating: Very Good
 - Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Monitor aquifer depressurisation and TARPS

Context

Risk Control Water volumes removed are checked against those specified in the model and licence requirements to ensure that aquifer pressures are managed, thus reducing the potential for mine floor heave, and the likelihood of cross contamination between aquifers.

Comments AGL allow redundancy in bore pumping system for pump outages and other disruptions. The optimisation of groundwater extraction reduces the potential for significant mine floor heave and thus mine stability.

The risk control is assessed based on the following factors:
 - Independence: Moderate (part of the Aquifer/weight balance modelling control).
 - Applicable: Mod-High

Based on the above, partial applicability is assigned as it is part of the Aquifer/weight balance modelling control.

Active Risk Scenarios ID: RR-R-00064



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03052	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	13-Oct-2015	Good

Base Control Comments
 GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group.

Stability analysis and batter design, ground movement modelling (predictions).

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
 Aquifer/weight balance modelling

Risk Control Comments
 This determines the minimum target for depressurisation to prevent mine floor heave. Also, the trigger levels are calculated and these are incorporated into the TARPs.

The risk control is assessed via the following factors:

- Independence: Moderate (Part of Monitor aquifer depressurisation and TARPS control).
- Applicable: Mod-High

Based on the above, partial applicability is assigned as part of the Monitor aquifer depressurisation and TARPS control.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03251	BC-00425	Aquifer Depressurisation Annual Report	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
 This annual report specifies the volumes of artesian dewatering required to maintain mine stability.

This is considered a critical activity for mine stability. It is a mature and established process. It is essential in maintaining safe operations within the mine. The process is monitored and reviewed. There is also an external audit required within the process.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Very Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
 Optimisation of groundwater extraction to minimise subsidence effects

Risk Control Comments
 The optimisation of groundwater extraction aims to balance the need for mine stability and other impacts of aquifer depressurisation.

The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: Low (does not prevent cross contamination)

Based on the above, no applicability is assigned.

Cause	Code	Status	Likelihood	Contribution
Cross contamination of regional aquifers as a result of exploration drilling activities	RR-CA-00609	Active	Current Unlikely (2)	46.6%
			Proposed Unlikely (2)	46.6%



Comments Exploration drilling activities may result in ground disturbance / interconnection of aquifers resulting in potential groundwater contamination. This has the potential to damage the structure between the aquifers (T1 and MFA).

The exploration drilling activities is managed by permits and licence requirements. With current drilling practices, the likelihood of this event, is considered to be UNLIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02503	BC-00450	Third party contractual agreement (drilling contractors)	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments The contractual agreement specifies how drilling activities are to be undertaken.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness of the control is considered as GOOD.

Risk Control Context Third party contractual agreement (drilling contractors)

Risk Control Comments The requirements to comply with the exploration licence conditions is specified in this agreement.

The risk control is assessed via the following factors:

- Independence: Low (Considered in cause likelihood)
- Applicable: Mod-High

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Cause	Code	Status	Likelihood	Contribution
Cross contamination of regional aquifers as a result of historical drilling activities or mine related bores	RR-CA-00715	Active	Current	Possible (3) 48.5%
			Proposed	Possible (3) 48.5%

Comments There is a number of drill holes that date back to late 1800s. These drill holes have poor record and unknown construction techniques. There is a number of mine related bores which may fit this profile. The likelihood of one of this drill holes failing is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03056	BC-00449	LV Regional Groundwater Management Plan - Regional Bore	No Owner Defined	In Service	31.0%	Critical Control	Administrative	5-Oct-2015	Good

Base Control Comments Through the ongoing updating and maintenance of the regional bore database, potential high risk bores are identified and remediation plans are adopted, as appropriate.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative/Engineering
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Maintenance of the regional bore database

Risk Control Comments Condition of Extraction licence (#2007440)

The risk control is assessed via the following factors:

- Independence: Moderate (part of the Maintenance of the regional bore database control)
- Applicable: Mod-High

Based on the above, partial applicability is assigned as this is part of the Maintenance of the regional bore database control.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03057	BC-00449	LV Regional Groundwater Management Plan - Regional Bore	No Owner Defined	In Service	31.0%	Critical Control	Administrative	13-Oct-2015	Good

Base Control Comments Through the ongoing updating and maintenance of the regional bore database, potential high risk bores are identified and remediation plans are adopted, as appropriate.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative/Engineering
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Inspection and maintenance program for regional bores

Risk Control Comments The risk control is assessed via the following factors:
 - Independence: Moderate (part of the Inspection and maintenance program for regional bores control)
 - Applicable: Mod-High

Based on the above, partial applicability is assigned as this is part of the Inspection and maintenance program for regional bores control.

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Damage to regional aquifers	RR-CQ-00498	Environment & Community	Current	Unlikely (2) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate
			Proposed	Unlikely (2) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate



Risk Scenario Details

Status Active

Top Event **Impact to land (Level 1/2)**

Scenario **Mining operations which could cause consequence Level 1/2 impact to the environment (ground movement / land degradation)**

Comments None of the causes identified have the potential to impact public safety.

Ratings Qualitative (Automatically Calculated)

Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max Consequence Risk
Current	Likely (4)	Environment & Community		Level 1 (0.5)		Moderate
Proposed	Likely (4)	Environment & Community		Level 1 (0.5)		Moderate

Causes

Cause	Description	Code	Status	Likelihood	Contribution
	Damage or unauthorised removal of European or Aboriginal Archaeology and Heritage sites due to mining activities	RR-CA-00549	Active	Current: Almost Certain (5) Proposed: Almost Certain (5)	9.0%

Comments There is a potential for artefacts to be damaged or removed during mining activities (exploration, excavation etc.). The artefacts that have been identified are not considered to be of significant value.

As surveys have identified and retrieved artefacts within the Mine Lease Area, the likelihood of this event is considered to be ALMOST CERTAIN.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02380	BC-00430	Cultural Heritage Management Plans (CHMP)	No Owner Defined	In Service	100.0%	Non-Critical Control	Procedural	7-Oct-2015	Very Good

Base Control Comments A Registered Aboriginal Party (RAP) approved Cultural Heritage Management Plan (CHMP), has been developed for mining operations. These plans involve the clearance and recovery of any artefacts that may be damaged by the mining activity. Cultural Heritage Management Plans are generally developed 5 to 7 years ahead of the mining operations to allow for any variations to the mining sequence, clearance of artefacts and recovery of topsoil.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: V.Good
 - Monitoring/Auditing: Monitored and Audited

Based on the above, the effectiveness is assessed to be VERY GOOD.

Risk Control Context Cultural Heritage Management Plans (CHMP) in place for current operational areas

Risk Control Comments This control is considered to be robust and effective. The control is also third party approved and reviewed.

The risk control is assessed based on the following factors:
 - Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Cause	Description	Code	Status
	Localised subsidence due to areas of fire leaving burnt out voids	RR-CA-00583	Rejected

Comments This hazard may result in localised/limited unstable areas within the mine void. There is a potential exposure to external fire fighters. The risk associated with this is considered in RR-R-00073. As this event is not expected to result in any environmental impacts, this cause is rejected.

Cause	Description	Code	Status	Likelihood	Contribution
	Subsidence of overburden dump due to instability from weakened or wet materials	RR-CA-00587	Active	Current: Unlikely (2) Proposed: Unlikely (2)	0.0%

Active Risk Scenarios ID: RR-R-00065



Comments Overburden dump instability may result in large scale failure of permanent batter. Material flow that may impact mine infrastructure ie. treatment ponds, road, settling pond.

Poor strength and/or wet materials placed in dump causing instability. Ground movement, poor drainage, over height dumping. Seismic event - liquefaction potential.

This may extend to the Mining Licence boundary on the western side. The effects of this is contained within the Mine Lease Area with no impact on the environment or public safety outside of the Mine Lease Area.

The likelihood of this event is considered to be UNLIKELY.

Risk Control Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
RR-COP-02990	BC-00441	Geotechnical Inspections and TARPS	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Based on the results of the inspection, further activities are undertaken as required, which may include pin monitoring. Carry out mine inspections following significant rainfall events (consistent with TARP) or other defined trigger events including ground movement episodes and seismic events. Key stability monitoring bores have been identified and are monitored at regular intervals and in association with trigger rainfall events.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Geotechnical Inspections and TARPS

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: High
 - Applicable: Mod - High

Based on the above, full applicability is assigned.

Risk Control Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
RR-COP-02991	BC-00439	Surface drainage inspection and maintenance	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Surface drainage maintenance (including clay capping) to minimise surface water inflows to coal joints, horizontal drains (monitoring and maintenance), regular stability assessment and modelling using current groundwater levels (TARP).

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed as GOOD.

Risk Control Context Surface drainage inspection and maintenance

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: High
 - Applicable: Low

Based on the above, partial applicability is assigned.

Cause	Code	Status	Likelihood	Contribution
Land movement due to inadequate aquifer depressurisation	RR-CA-00603	Active	Current	Unlikely (2) 0.1%
			Proposed	Unlikely (2) 0.1%



Comments Potential pathways include:
 - inability to remove groundwater
 - lack of equipment/spares due to deterioration in storage
 - unstable ground conditions

Inadequate aquifer depressurisation can potentially result in mine floor heave. Mine floor heave can impact the structural integrity of regional aquifers. This is addressed in RR-R-00064. The impacts of this event is limited to the Mine Lease Area. This could potentially trigger batter movement.

The likelihood of this event is considered to be UNLIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02993	BC-00441	Geotechnical Inspections and TARPS	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Based on the results of the inspection, further activities are undertaken as required, which may include pin monitoring. Carry out mine inspections following significant rainfall events (consistent with TARP) or other defined trigger events including ground movement episodes and seismic events. Key stability monitoring bores have been identified and are monitored at regular intervals and in association with trigger rainfall events.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Geotechnical Inspections and TARPS

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: Low (part of groundwater modelling, extraction and monitoring)
 - Applicable: Moderate

Based on the above, partial applicability is assigned as this is part of the groundwater modelling, extraction and monitoring.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-02994	BC-00445	Groundwater modelling, extraction and monitoring	No Owner Defined	In Service	31.0%	Non-Critical Control	7-Oct-2015	Good

Base Control Comments Regional subsidence modelling. LV Regional Groundwater Committee to collaborate on depressurisation program. GCMP - pin survey monitoring program including regional pin network. Maintenance inspections and pipe pressure monitoring.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Groundwater modelling, extraction and monitoring

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: Low (part of Geotechnical Inspections and TARPS)
 - Applicable: High

Based on the above, partial applicability is assigned as this is part of Geotechnical Inspections and TARPS.

Cause	Description	Code	Status
	Damage to potable water services to parts of Traralgon due to ground movement from mining activities	RR-CA-00628	Rejected



Comments

Potential pathways include:
 - aquifer depressurisation
 - mining activity

Failure on the pipeline may affect potable water supply to some parts of Traralgon. This may result in disruption to services and is considered not to be a risk to public safety or environment. Therefore, this is assessed as outside the Mine Risk Management Plan.

Cause

Ground movement single batter failure - operations

Code	Status	Likelihood	Contribution
RR-CA-00645	Active	Current Possible (3)	0.9%
		Proposed Possible (3)	0.9%

Comments

Ground movement of single batter due to:
 - undercutting
 - surface water build up
 - unfavourable structures / jointing

The likelihood of this event is considered to be POSSIBLE.

Risk Control

Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
RR-COP-02792	BC-00166	Daily Mine Inspections	No Owner Defined	In Service	31.0%	Non-Critical Control	Administrative	1-Sep-2015	Average

Base Control

Shift personnel are required to undertake work place inspection which includes looking for obvious ground related issues, i.e. ground movement and hotspots.

Comments

The base control is assessed via the following:

- Implemented: Part
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be AVERAGE.

Risk Control

Daily mine inspections and operator action

Context

Risk Control

The inspections will identify any incorrect batter angle that may have occurred, an assessment is then made on the appropriate corrective action. Supervisor undertakes inspection of batter including the operating face daily.

Comments

The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: Moderate

Based on the above, partial applicability is assigned.

Actions

Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
RR-A-00046	Formalise the process of conducting daily mine inspections which includes looking for obvious ground related issues, i.e. ground movement and hotspots.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00065



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02997	BC-00441	Geotechnical Inspections and TARPS	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
Based on the results of the inspection, further activities are undertaken as required, which may include pin monitoring. Carry out mine inspections following significant rainfall events (consistent with TARP) or other defined trigger events including ground movement episodes and seismic events. Key stability monitoring bores have been identified and are monitored at regular intervals and in association with trigger rainfall events.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
Geotechnical Inspections and TARPS

Risk Control Comments
The risk control is assessed based on the following factors:
- Independence: Low (part of ground movement modelling and monitoring)
- Applicable: Moderate

Based on the above, partial applicability is assigned as this is part of ground movement modelling and monitoring.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02998	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
GOMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group.

Stability analysis and batter design, ground movement modelling (predictions).

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
Ground movement modelling and monitoring

Risk Control Comments
GOMP - pin surveys including calculation of strain along radial survey lines. Subsidence predictions along area of current alignment. Piezometer observations are made to observe water level.

There are survey pins which are monitored regularly. This data is regularly reviewed to determine the location of the ground movement. Based on ground strains and ground movement limits, this study would trigger actions following the analysis, this would subsequently trigger actions to reduce the likelihood of this cause.

The risk control is assessed based on the following factors:

- Independence: Low-Moderate (Part of Geotechnical Inspections and TARPS)
- Applicable: Mod-High

Based on the above, partial applicability is assigned as this is part of the Geotechnical Inspections and TARPS.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Acid mine drainage from the overburden dump impacting land	RR-CA-00707	Active	Current Likely (4)	89.9%
			Proposed Likely (4)	89.9%



Comments Potential pathways include:
- exposed sulphites within excavated material to rainwater and surface water

The acid mine drainage from the OB dump is expected to be contained within the Mine Lease Area. This event is occurring in some small areas, therefore, the likelihood of this event is considered to be LIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02986	BC-00418	Hydrological model for the overburden dump runoff	No Owner Defined	In Service	31.0%	Non-Critical Control	Administrative	7-Oct-2015	Average

Base Control Comments This control assesses the runoff and hydrology of the overburden dump. It provides information allowing identification and response on targeted areas preventing acidification. This is conducted once every 5 years.

The base control is assessed via the following:
- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: None

Based on the above, the effectiveness is assessed to be AVERAGE.

Risk Control Context Hydrological model for the overburden dump runoff

Risk Control Comments The risk control is assessed based on the following factors:
- Independence: Low (part of the Ongoing Rehabilitation and Seepage Program)
- Applicable: Mod-High

Based on the above, partial applicability is assigned as the control is part of the Ongoing Rehabilitation and Seepage Program.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02987	BC-00408	Environmental site plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments The plan specifies the allowable discharge limits as referenced in the EPA licence 11149 conditions.

This includes ongoing visual inspection and remediation of targeted areas following the hydrological model and monitoring.

The base control is assessed via the following:
- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: None

Based on the above, the effectiveness is assessed to be AVERAGE.

Risk Control Context Ongoing Rehabilitation and Seepage Program

Risk Control Comments The risk control is assessed based on the following factors:
- Independence: Moderate (part of Hydrological model for the overburden dump runoff)
- Applicable: Moderate

Based on the above, partial applicability is assigned as this is part of Hydrological model for the overburden dump runoff.

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Ground movement / land degradation with the potential to impact the environment	RR-CQ-00456	Environment & Community	Current	Level 1 (0.5)	Moderate
			Proposed	Level 1 (0.5)	Moderate



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02999	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Emergency Response Procedure
Context

Risk Control Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.
Comments

The risk control is assessed based on the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Impact to land (Level 3)**

Scenario **Mining operations which could cause Level 3 impact to the environment (ground movement / land degradation) and or public safety**

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current		Unlikely (2)		Environment & Community	Level 3 (1.5)				Low
Proposed		Unlikely (2)		Environment & Community	Level 3 (1.5)				Low

Causes

Cause	Description	Code	Status	Likelihood	Contribution
	Damage to Saline Waste Outfall Pipeline (SWOP) due ground movement from mining activities	RR-CA-00552	Active	Current Proposed	Rare (1) Rare (1) 0.3% 0.5%

Comments There is a potential that mining activities may result in ground movement that could affect the mechanical integrity of the SWOP system. This may result in failure of the pipeline causing a leak of saline water to land.

The area where the SWOP traverse is not an area that is subject to significant strain nor significant ground movement. Therefore, the likelihood of this event occurring is considered to be RARE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02387	BC-00444	Subsidence modelling and monitoring	No Owner Defined	In Service	0.0%	Non-Critical Control	Procedural	7-Oct-2015	Good

Base Control Comments The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness of the control is assessed as GOOD.

Risk Control Context Subsidence modelling and monitoring

Risk Control Comments Regional subsidence modelling. LV Regional Groundwater Committee to collaborate on depressurisation program. GCMP - pin survey monitoring program including regional pin network. Maintenance inspections and pipe pressure monitoring. Subsidence modelling and monitoring is considered to assist in identifying the risk.

The risk control is assessed based on the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02708	BC-00429	Gippsland Water Authority & AGL Agreement	No Owner Defined	In Service	100.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments The agreement sets the roles and responsibilities between AGL and Gippsland Water regarding the management of the SWOP pump station and pipeline.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be GOOD .

Risk Control Context Third party bi-weekly visual inspection of the pipeline

Risk Control Comments Bi-weekly visual inspection conducted by Gippsland Water.

The risk control is assessed based on the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Cause	Code	Status	Likelihood	Contribution
Regional subsidence due to groundwater extraction from mining activities	RR-CA-00585	Active	Current	Unlikely (2) 32.8%
			Proposed	Unlikely (2) 46.5%

Comments Potential pathways include:
 - tensile strains due to stress relief and additional strains due to block movement
 - horizontal movement due to block movement.

Regional subsidence that may impact community services, i.e.:

- Sewage - ground movement exceeding design criteria (alongside Traralgon Creek Rd)
- gas
- potable water services
- pavement/housing
- Hydraulic sewer flow impact due to change in grade
- Old LCC Landfill / Transfer Station - ground movement exceeds tolerance limits. Failure of natural liner and clay cap, redistribution of waste materials, exposure of hazardous materials.

The infrastructure which could potentially be impacted is situated at a distance from the mine hence, the tilt and ground strains is considered to be minor. Therefore, the likelihood of this event is considered to be UNLIKELY.

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02666	BC-00426	LV Regional Groundwater Management Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments The modelling and monitoring reports are provided to Southern Rural Water. AGL Loy Yang provide information for input into the regional subsidence modelling and monitoring. They enable predictive modelling of subsidence which form the basis of the amount of groundwater removal. This ensures that overall subsidence is monitored.

The base control is assessed via the following factors:

- Implemented: Yes
- Control type: Administrative
- Reliability rating: Fair
- Monitoring/Auditing: Ad-hoc

The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Regional coordination modelling and monitoring of subsidence

Risk Control Comments The output from this control is combined with the subsidence modelling and monitoring control.

The risk control is assessed based on the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02988	BC-00444	Subsidence modelling and monitoring	No Owner Defined	In Service	0.0%	Non-Critical Control	Procedural	8-Oct-2015	Good

Base Control Comments The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness of the control is assessed as GOOD.

Risk Control Context Subsidence modelling and monitoring

Risk Control Comments Pin line and water level monitoring; regular (12-month reporting) assessment of strain levels. Subsidence modelling and monitoring is considered to assist in identifying the risk.

This is not expected to stop the actual regional subsidence.

The risk control is assessed based on the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.

Cause	Code	Status	Likelihood	Contribution
Fire Services Pond wall failure due to ground movement from a seismic event	RR-CA-00594	Active	Current Rare (1)	0.1%
			Proposed Rare (1)	0.2%

Comments A seismic event may induce ground strains, in combination with the northern Ash Pond wall failure could potentially impact the Loy Yang B. The likelihood of this event is considered to be RARE.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02465	BC-00423	Dam Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	Dam management plan includes TARPs to which will trigger a response to mitigate the effects of ground movement. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness is assessed to be GOOD.										
Risk Control Context	Dam managed as per ANCOLD guidelines										
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: High - Applicable: High Based on the above, full applicability is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02667	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	31.0%	Critical Control	Administrative	8-Oct-2015	Good
Base Control Comments	TARPs will trigger actions to mitigate the events of ground movement. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness is assessed to be GOOD.									
Risk Control Context	Emergency Management Plan and TARPs									
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: Moderate (part of the Dam managed as per ANCOLD guidelines) - Applicable: Moderate Based on the above, partial applicability is assigned as part of the Dam managed as per ANCOLD guidelines.									

Cause	Code	Status	Likelihood	Contribution	
OB run off pond wall failure due to seismic event or extreme rainfall	RR-CA-00597	Active	Rare (1)	1.1%	
			Proposed	Rare (1)	1.5%
Comments	In the event of a seismic event or extreme rainfall, there is a potential to result in an uncontrolled discharge of water to Traralgon Creek and minor inundation of Traralgon Creek Road. The likelihood of the natural events to result in this failure is considered to be RARE.				



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02673	BC-00423	Dam Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Dam management plan includes TARPs to which will trigger a response to mitigate the effects of ground movement.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Dam managed as per ANCOLD guidelines

Risk Control Comments The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: Low (not specific to OB run off pond walls)

Based on the above, no applicability is assigned. Note that implementation of action will increase the applicability of this control.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02674	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	31.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments TARPs will trigger actions to mitigate the events of ground movement.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Emergency Management Plan and TARPs

Risk Control Comments The risk control is assessed based on the following factors:

- Independence: Moderate (part of the Dam managed as per ANCOLD guidelines)
- Applicable: Moderate

Based on the above, partial applicability is assigned as part of the Dam managed as per ANCOLD guidelines.

Cause	Code	Status	Likelihood	Contribution
Damage to Saline Waste Outfall Pipeline (SWOP) due to internal corrosion/wear	RR-CA-00630	Active	Rare (1)	0.0%
			Proposed	Rare (1)
				0.0%

Comments The SWOP is maintained by and licensed to Gippsland Water Authority.

Pinhole leaks have occurred, however they have not met the material threshold of a short to medium term environmental impact. For this scenario to escalate, it would require the leak to occur for a few days. Therefore, the likelihood of this event is considered to be RARE.

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02656	BC-00429	Gippsland Water Authority & AGL Agreement	No Owner Defined	In Service	100.0%	Critical Control	Administrative	8-Oct-2015	Good
Base Control Comments	The agreement sets the roles and responsibilities between AGL and Gippsland Water regarding the management of the SWOP pump station and pipeline. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc Based on the above, the effectiveness is assessed to be GOOD .									
Risk Control Context	Third party bi-weekly visual inspection of the pipeline									
Risk Control Comments	Bi-weekly visual inspection conducted by Gippsland Water. The risk control is assessed based on the following factors: - Independence: High - Applicable: High The inspection would allow for detection of the leaks. Based on the above, full applicability is assigned.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02657	BC-00429	Gippsland Water Authority & AGL Agreement	No Owner Defined	In Service	100.0%	Critical Control	Administrative	8-Oct-2015	Good
Base Control Comments	The agreement sets the roles and responsibilities between AGL and Gippsland Water regarding the management of the SWOP pump station and pipeline. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc Based on the above, the effectiveness is assessed to be GOOD .									
Risk Control Context	Third party pipe integrity testing									
Risk Control Comments	This is formal testing conducted by Gippsland Water which is able to identify and segregate the area of pipe requiring replacement. AGL conducts regular meetings and liaison with Gippsland Water to manage this control. The risk control is assessed based on the following factors: - Independence: High - Applicable: High Based on the above, full applicability is assigned.									

Cause	Code	Status	Likelihood	Contribution
Fire Services Pond wall failure due to internal drainage failure	RR-CA-00631	Active	Current Rare (1)	0.1%
			Proposed Rare (1)	0.2%
Comments	Potential pathways include: - pipe failure - compromised drainage There is low differential loading between the SWOP and Fire Service Pond walls. Therefore, the likelihood of this event is considered to be RARE.			

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02669	BC-00423	Dam Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	Dam management plan includes TARPs to which will trigger a response to mitigate the effects of ground movement. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness is assessed to be GOOD.										
Risk Control Context	Dam managed as per ANCOLD guidelines										
Risk Control Comments	Inspection and risk rating as per ANCOLD Guideline. The risk control is assessed based on the following factors: - Independence: High - Applicable: High Based on the above, full applicability is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02670	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	31.0%	Critical Control	Administrative	8-Oct-2015	Good
Base Control Comments	TARPs will trigger actions to mitigate the events of ground movement. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness is assessed to be GOOD.									
Risk Control Context	Emergency Management Plan and TARPs									
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: Low (part of the Dam managed as per ANCOLD guidelines) - Applicable: Moderate Based on the above, partial applicability is assigned as part of the Dam is managed as per ANCOLD guidelines.									

Cause	Code	Status
OB run off pond wall failure due to ground movement as a result of mining activities	RR-CA-00632	Rejected
Comments	Strain on the wall structure coupled with elevated hydraulic loading. The amount of ground movement as a result of mining activity is expected to be uniform/regular and at a magnitude less than normal loading of the OB run off pond wall structure. Therefore, this is not considered to be a credible cause of wall failure. Hence, this cause is rejected.	

Cause	Code	Status	Likelihood	Contribution
Degradation of land due to pest, plants and animals	RR-CA-00709	Active	Current Possible (3)	32.8%
			Proposed Possible (3)	46.5%

Active Risk Scenarios ID: RR-R-00066



Comments Mining activities have the potential to increase the level of pest, plants and/or animals that may result in land degradation. The potential impact may extend beyond the Mine Lease Area. The likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03000	BC-00446	Lease plan conditions	No Owner Defined	In Service	100.0%	Critical Control	Administrative	12-Oct-2015	Good

Base Control Comments Lease plan specifies how land is to be managed regarding pest, plants and animals.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

This is an active management control.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Management of pest plants and animals

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: High
 - Applicable: Mod - High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03001	BC-00285	Mine Internal Vegetation Management-ICE	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	12-Oct-2015	Good

Base Control Comments The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

This is an active management control.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Management of weed species

Risk Control Comments The risk control is assessed based on the following factors:
 - Independence: Low
 - Applicable: Low

Based on the above, no applicability is assigned.

Cause	Code	Status	Likelihood	Contribution
Change in creek bed grade and flood plains due to land subsidence as a result of aquifer depressurisation	RR-CA-00712	Active	Current	Possible (3) 32.8%
			Proposed	Possible (3) 4.7%

Comments There is a potential for this cause to result in local inundation and environmental impacts (substrate of the stream bed).

The likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-03012	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group. Stability analysis and batter design, ground movement modelling (predictions). The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited Based on the above, the effectiveness of the control is assessed to be GOOD.										
Risk Control Context	Subsidence modelling and monitoring										
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: Low - Applicable: Low Based on the above, no applicability is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03013	BC-00426	LV Regional Groundwater Management Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	The modelling and monitoring reports are provided to Southern Rural Water. AGL Loy Yang provide information for input into the regional subsidence modelling and monitoring. They enable predictive modelling of subsidence which form the basis of the amount of groundwater removal. This ensures that overall subsidence is monitored. The base control is assessed via the following factors: - Implemented: Yes - Control type: Administrative - Reliability rating: Fair - Monitoring/Auditing: Ad-hoc The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee. Based on the above, the effectiveness is assessed to be GOOD.									
Risk Control Context	Regional coordination modelling and monitoring of subsidence									
Risk Control Comments	The output from this control is combined with the subsidence modelling and monitoring control. The risk control is assessed based on the following factors: - independence: Low - Applicable: Low Based on the above, no applicability is assigned.									

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03014	BC-00425	Aquifer Depressurisation Annual Report	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
 This annual report specifies the volumes of artesian dewatering required to maintain mine stability.
 This is considered a critical activity for mine stability. It is a mature and established process. It is essential in maintaining safe operations within the mine. The process is monitored and reviewed. There is also an external audit required within the process.

- The base control is assessed via the following factors:
- Implementation: Yes
 - Control type: Administrative
 - Reliability rating: Very Good
 - Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
 Optimisation of groundwater extraction to minimise subsidence effects

Risk Control Comments
 The optimisation of groundwater extraction reduces the potential for significant mine floor heave and thus mine stability.

- The risk control is assessed based on the following factors:
- Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03015	BC-00426	LV Regional Groundwater Management Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	5-Oct-2015	Good

Base Control Comments
 The modelling and monitoring reports are provided to Southern Rural Water. AGL Loy Yang provide information for input into the regional subsidence modelling and monitoring. They enable predictive modelling of subsidence which form the basis of the amount of groundwater removal. This ensures that overall subsidence is monitored.

- The base control is assessed via the following factors:
- Implemented: Yes
 - Control type: Administrative
 - Reliability rating: Fair
 - Monitoring/Auditing: Ad-hoc

The process is monitored and audited by the regulator and reviewed by the Regional Groundwater Management committee.

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
 Regional and third party monitoring (every 5 years) reported to DEDJTR and Southern Rural Water

Risk Control Comments
 Condition of Extraction licence (#2007440)

- The risk control is assessed based on the following factors:
- Independence: High
 - Applicable: Low

Based on the above, no applicability is assigned.

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03016		Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.	No Owner Defined	Proposed	100.0%	Non-Critical Control	12-Oct-2015	Good

Risk Control Context
Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.

Risk Control Comments
The implementation of this action is expected to reduce the likelihood of this hazard by one order of risk reduction has been allocated to this action.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00021	Develop the trigger points for action that relates to subsidence (surface deviation) in relation to aquifer depressurisation for Traralgon Creek and its flood plain.		Normal		Pending		N/A

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Ground movement / land degradation with the potential to impact the environment	RR-CQ-00465	Environment & Community	Current	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low
			Proposed	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02684	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
TARPs will trigger actions to mitigate the events of ground movement.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context
Emergency Management Plan and TARPs

Risk Control Comments
The TARPs present an opportunity to reduce the likelihood of ground movement.

- The risk control is assessed based on the following factors:
- Independence: Moderate
 - Applicable: Mod-High

Based on the above, full applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02706	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedure

Risk Control Comments Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.

The risk control is assessed via the following factors:

- Independence: Low (not independent of Emergency Management Plan and TARP)
- Applicable: Mod-High

Based on the above, no applicability is assigned.

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Ground movement / land degradation with the potential to impact public safety	RR-CQ-00467	Public Safety	Current	Rare (1) Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours)	Low
			Proposed	Rare (1) Injury to a member of the public (requiring medical attention). Members of the public required to take temporary shelter or remain indoors for a short period of time (1-2 hours)	Low

Active Risk Scenarios ID: RR-R-00066



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02683	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>TARPs will trigger actions to mitigate the events of ground movement.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Emergency Management Plan and TARPs									
Risk Control Comments	<p>The TARPs present an opportunity to reduce the likelihood of ground movement.</p> <p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Mod-High <p>Based on the above, full applicability is assigned.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02707	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Response Procedure									
Risk Control Comments	<p>Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (not independent of Emergency Management Plan and TARPs) - Applicable: Mod-High <p>Based on the above, no applicability is assigned.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02981	BC-00199	External Buffers-Exclusion Zones	No Owner Defined	In Service	0.0%	Critical Control	Isolation	8-Oct-2015	Good

Base Control Comments Exclusion Zones 0110 code. The land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license.

The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. This include activities such as farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.

Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria. Exclusion zones around electrical infrastructure

The base control is assessed via the following:

- Implemented: Yes
- Type: Isolation
- Reliability: Good
- Monitoring/Auditing: None

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Reduced population and human activity in close proximity to affected area (buffer zone)

Risk Control Comments Exclusion Zones 0110 code. The land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license. The planning zone ultimately results in reduced population; reduced human activity in this zone may result in a reduced likelihood of fire.

The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. This include activities such as slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.

Exclusion zones in force bushfire mitigation plans in place and submitted to Energy Safe Victoria

Exclusion zones around electrical infrastructure.

The risk control is assessed based on the following factors:

- Independence: Low
- Applicable: Low

Based on the above, no applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Impact to land (Level 4/5)**

Scenario **Mining operations which could cause Level 4/5 impact to the environment (ground movement / land degradation) and or public safety**

Comments Subsidence may result in deterioration of roads surrounding the mine, which may pose a hazard to public safety. Relevant roads include Traralgon Creed Rd and Bartons Rd and the proposed Traralgon Bypass.

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max Consequence Risk
Current		Unlikely (2)		Public Safety	Level 5 (5)		Moderate
Proposed		Likely (4)		Public Safety	Level 5 (5)		High

Causes

Cause	Code	Status	Likelihood	Contribution
Localised ground movement as a result of subsidence due to mining activities affecting local roads	RR-CA-00565	Active	Current Possible (3)	48.4%
			Proposed Possible (3)	1.0%

- Comments Possible pathways include:
- groundwater extraction
 - adverse jointing arrangements
 - ground movement induced from mining activities
 - excessive infiltration of water into batter cracks and joints (increase pore pressures)

The above pathways have the potential to result in subsidence that may impact Traralgon Creek Rd, Bartons Lane (Hyland Highway) and the proposed Traralgon Bypass alignment.

The likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00067



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02637	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group. Stability analysis and batter design, ground movement modelling (predictions). The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited Based on the above, the effectiveness of the control is assessed to be GOOD.										
Risk Control Context	Ground movement modelling and monitoring										
Risk Control Comments	GCMP - pin surveys including calculation of strain along radial survey lines. Plan progressive rehabilitation with consideration to potential freeway alignment. Update of rehabilitation concept with assumption that freeway will be in place (Dec 2014). Subsidence predictions along area of current alignment. Piezometer observations are made to observe water level. There are survey pins which are monitored regularly. This data is regularly reviewed to determine the location of the ground movement. Based on ground strains and ground movement limits, this study would trigger actions following the analysis. This would subsequently trigger actions that would reduce the likelihood of this cause. The risk control is assessed based on the following factors: - Independence: Moderate (Part of the Geotechnical Inspections and TARPS control) - Applicable: High Based on the above, partial applicability is assigned as it is part of the Geotechnical Inspections and TARPS control.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02639	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group. Stability analysis and batter design, ground movement modelling (predictions). The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited Based on the above, the effectiveness of the control is assessed to be GOOD.										
Risk Control Context	Geotechnical Inspections and TARPS										
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: Moderate (Part of the Ground movement modelling and monitoring control) - Applicable: Moderate Based on the above, partial applicability is assigned as this is part of the Ground movement modelling and monitoring control.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking



RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.	Normal	Pending	N/A
RR-A-00019	Amend the trigger action response plan to include visual inspections of public roads which are potentially at risk.	Normal	Pending	N/A

Cause	Planned Traralgon Bypass and associated development to impact surface water and mine stability	Code	Status	Likelihood	Contribution					
		RR-CA-00569	Active	Current Proposed	Rare (1) Likely (4) 4.6% 98.0%					
Comments	<p>The planned Traralgon Bypass development has the potential to impact surface water and the mine stability, which will have an impact to the overall area, including the bypass and associated infrastructure.</p> <p>A recent committee forum held by the West Gippsland Catchment Authority indicated that the authority plans to implement flood protection for Traralgon would result in surface water being stored on the Western Batters. This concept is expected to present a significant risk to the Western Batters which could result in changing of the Traralgon Creek bed. Therefore, without AGL's involvement in the planned Traralgon Bypass project, the future likelihood of ground movement is considered to be LIKELY.</p>									
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment	
	RR-COP-02974		AGL to engage with the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.	System Administrator	Proposed	100.0%	Non-Critical Control	12-Oct-2015	Assessed	
Risk Control Context	AGL to engage with the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.									
Risk Control Comments	Learnings from the Morwell main drain project should be considered as part of this process. The action is expected to reduce the likelihood of this event, however, this is highly dependent on the external party (authorities) understanding the risk and implementing actions to prevent/mitigate the event. (There is potential that appropriate actions can mitigate this hazard). Conservatively no future risk reduction is assigned.									
Actions	Code	Objective	Work to be Done			Priority	Implementer	Status	Complete By	Tracking
	RR-A-00054	AGL should engage the department and planning authorities to ensure that the risks of the planned Traralgon Bypass are considered and addressed.				Normal		Pending		N/A

Cause	Subsidence due to coal block sliding impacting Traralgon Creek Road.	Code	Status	Likelihood	Contribution
		RR-CA-00588	Active	Current Proposed	Likely (4) Likely (4) 46.5% 1.0%
Comments	<p>Coal block sliding (mine permanent western batters) has the potential to impact Traralgon Creek Road.</p> <p>Potential pathways include:</p> <ul style="list-style-type: none"> - Water levels elevated (ponded water bodies, inflow source, etc.) - strain-softening (progressive weakening), progressive failure - creep movements - low shear-strength interseam and / or - coal contact - structural complexities (eg: continuous and unfavourably oriented fault / interconnecting structures) - water ingress due to erosion and piping - water ingress from settling pond (failure of liner) <p>The likelihood of this event is considered to be LIKELY.</p>				

Active Risk Scenarios ID: RR-R-00067



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02644	BC-00441	Geotechnical Inspections and TARPS	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>Based on the results of the inspection, further activities are undertaken as required, which may include pin monitoring. Carry out mine inspections following significant rainfall events (consistent with TARP) or other defined trigger events including ground movement episodes and seismic events. Key stability monitoring bores have been identified and are monitored at regular intervals and in association with trigger rainfall events.</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative - Reliability rating: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Geotechnical Inspections and TARPS									
Risk Control Comments	<p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Low (not specific to cause) <p>Based on the above, no applicability is assigned.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02975	BC-00439	Surface drainage inspection and maintenance	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>Surface drainage maintenance (including clay capping) to minimise surface water inflows to coal joints, horizontal drains (monitoring and maintenance), regular stability assessment and modelling using current groundwater levels (TARP).</p> <p>The base control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Implementation: Yes - Control type: Administrative - Reliability rating: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed as GOOD.</p>									
Risk Control Context	Surface drainage inspection and maintenance									
Risk Control Comments	<p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: High - Applicable: High <p>Based on the above, full applicability is assigned.</p>									



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02976	BC-00440	Subsurface (horizontal drains) drainage inspection and maintenance	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Although drains are considered to be an engineering control, they could be blocked (restriction in flow) if not appropriately maintained, therefore, it is considered to be an administrative type control. The control is regularly monitored and there is annual inspection.

The base control is assessed via the following factors:

- Implementation: Yes
- Control type: Administrative
- Reliability rating: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Subsurface (horizontal drains) drainage inspection and maintenance

Risk Control Comments Surface drainage maintenance (including clay capping) to minimise surface water inflows to coal joints, horizontal drains (monitoring and maintenance), regular stability assessment and modelling using current groundwater levels (TARP).

The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: High

Based on the above, full applicability is assigned.

Cause	Description	Code	Status
	Settling Pond, Ash Pond and High Level Storage Dam wall failure due to seismic event or extreme rainfall	RR-CA-00591	Rejected
Comments	The Settling Pond, Ash Pond and High Level storage Dam are located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore this cause is rejected.		
	High Level Storage Dam, Ash Pond and Fire Services Pond wall failure due to ground movement as a result of mining activities	RR-CA-00592	Rejected
Comments	The localised mining induced ground strains are not of sufficient magnitude to impact the structural integrity of the High Level Storage Dam, Ash Pond and Fire Services Pond. Therefore, this cause is rejected.		

Cause	Description	Code	Status	Likelihood	Contribution
	Settling Pond wall failure due to ground movement as a result of mining activities	RR-CA-00595	Active	Current Unlikely (2)	0.5%
				Proposed Unlikely (2)	0.0%

Comments Historically, there has been exposed coal under the pond that has resulted in cracks being a conduit for leaks. In the event of a significant ground movement, there is potential for the integrity of the dam wall to be compromised. This may result in a significant loss of containment of material within the Settling Pond.

The likelihood of this event is considered to be UNLIKELY.

Active Risk Scenarios ID: RR-R-00067



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02463	BC-00423	Dam Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good	
Base Control Comments	Dam management plan includes TARPs to which will trigger a response to mitigate the effects of ground movement. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness is assessed to be GOOD.										
Risk Control Context	Emergency Management Plan and TARPs										
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: High - Applicable: High Based on the above, full applicability is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02646	BC-00443	Inspection, monitoring and maintenance of the Settling Pond	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	Program for the inspection, monitoring and maintenance of the Settling Pond. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Inspection, monitoring and maintenance of the Settling Pond									
Risk Control Comments	The risk control is assessed based on the following factors: - Independence: High - Applicable: High Based on the above, full applicability is assigned.									

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Ground movement / land degradation with the potential to impact public safety	RR-CQ-00479	Public Safety	Current	Rare (1) Serious harm to a member or injury to members of the public. Members of the public required to be displaced for a long period of time (days)	Moderate
			Proposed	Unlikely (2) Serious harm to a member or injury to members of the public. Members of the public required to be displaced for a long period of time (days)	High



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02648	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Response Procedure									
Risk Control Comments	<p>Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (not independent of Emergency Management Plan and TARPs) - Applicable: Mod-High <p>Based on the above, no applicability is assigned, as it is not independent of the Emergency Management Plan and TARPs.</p>									
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02651	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	<p>TARPs will trigger actions to mitigate the events of ground movement.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Emergency Management Plan and TARPs									
Risk Control Comments	<p>The rate of deterioration of the road to the point where someone may be injured is expected to take a significant period of time. During this time, the Emergency Management Plan and TARPs are expected to present opportunities for AGL to mitigate the effects of road damage.</p> <p>The risk control is assessed based on the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Mod-High <p>Based on the above, full applicability is assigned.</p>									
Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability				
	RR-IE-03274	Probability of ground movement escalating to consequence	Active	Current	Rare (1)	50.0%				
				Proposed	Possible (3)	50.0%				
Comments	<p>Subsidence due to ground movement has the potential to deteriorate the roads surrounding the mine. This may pose a hazard to public safety. There is a potential to implement controls that mitigate the hazard, i.e. reduce speed limits, road closures etc. Therefore the likelihood of the event to eventuate to the consequence is considered to be 50%.</p>									
Consequence	Code	Category	Likelihood	Severity	Risk Rating					
		Ground movement / land degradation with the potential to impact the environment								

Active Risk Scenarios ID: RR-R-00067



RR-CQ-00481

Environment & Community

Current

Rare (1)

Significant medium term impact on important environment/habitat and/or widespread local community complaints.

Moderate

Proposed

Unlikely (2)

Significant medium term impact on important environment/habitat and/or widespread local community complaints.

High

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02649	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedure

Risk Control Comments Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.

The risk control is assessed via the following factors:

- Independence: Low (not independent of Emergency Management Plan and TARPs)
- Applicable: Mod-High

Based on the above, no applicability is assigned, as it is not independent of the Emergency Management Plan and TARPs.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02652	BC-00442	Emergency Management Plan and TARPs	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments TARPs will trigger actions to mitigate the events of ground movement.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Emergency Management Plan and TARPs

Risk Control Comments The TARPs present an opportunity to reduce the likelihood of ground movement.

The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Active Risk Scenarios ID: RR-R-00067



Intermediate Event	Code	Description	Status	Current	Incoming	Outgoing	Probability
	RR-IE-02982	Probability of ground movement escalating to consequence	Active	Proposed	Rare (1) Possible (3)	Rare (1) Unlikely (2)	50.0% 50.0%
Comments	Once ground movement occurs to the point where the grade of the creek bed is changing, it is difficult to reverse this process. There is a potential for mitigative controls to improve the creek health and further mitigate the adverse effect of change of creek. There is also a potential to reduce the magnitude of the impacts. Therefore the likelihood of the event to eventuate to the consequence is considered to be 50%.						

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Settling pond dam wall failure induced flood event with the potential to impact public safety	RR-CQ-00499	Public Safety	Current	Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High
			Proposed	Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02650	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments
 The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:
 - Vic police
 - EPA
 - West Gippsland Catchment Management Authority
 - Gippsland Water and
 - Department of Health etc.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
 Emergency Response Procedure

Risk Control Comments
 The risk control is assessed via the following factors:
 - Independence: Low (not independent of Emergency Management Plan and TARP)
 - Applicable: Mod-High

Based on the above, no applicability is assigned, as it is not independent of the Emergency Management Plan and TARP.

Active Risk Scenarios ID: RR-R-00067



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02653	BC-00423	Dam Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	7-Oct-2015	Good

Base Control Comments Dam management plan includes TARPs to which will trigger a response to mitigate the effects of ground movement.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Emergency Management Plan and TARPs

Risk Control Comments The TARPs present an opportunity to reduce the likelihood of ground movement.

The risk control is assessed based on the following factors:

- Independence: Moderate
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00024	Incorporate Sheepwash Creek flow retention area into the Dam Management Plan and adopt ANCOLD guidelines for management.		Normal		Pending		N/A

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-02476	Likelihood adjustment for Settling Pond dam wall failure cause only	Active	Rare (1)	Rare (1)	0.1%
				Proposed	Possible (3)	0.1%

Comments There is only one cause contributing to this consequence. Based on this, the probability of the event has been reduced to coincide with the contributing cause of Settling Dam wall failure (i.e. RARE). Therefore, probability of 0.1% is assigned to this consequence.



Risk Scenario Details

Status Active

Top Event **Fugitive dust emissions**

Scenario **Mining operations generating fugitive dust emissions which may impact public safety and/or loss of amenity/nuisance**

Comments This requires the following:
 - Air emission that causes nuisance to the public
 - Visible emission

The mine operations associated with water, land and discharges to water: EPA Licence 11149

Environmental Management: Mining and Extractive Industries (Mining PEM):

- 1. PM10: 60 ug/m3 (24-hour averaging period)
- 2. PM2.5: 25 ug/m3 (24-hour averaging period)
- 3. Respirable crystalline silica (as PM2.5): 3ug/m3 (annual average)

Landfill sites can generate odour. However, the mine site landfill contains exclusively leached ash and no green waste. No credible sources of odour emissions associated with mining or leached ash landfill activities extending offsite have been identified. Therefore, these activities are not considered to be a credible cause for odour emissions.

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence Severity	Max Consequence Risk
Current	Unlikely (2)		Environment & Community		Level 3 (1.5)	Moderate
Proposed	Unlikely (2)		Environment & Community		Level 3 (1.5)	Moderate

Causes

Cause	Description	Code	Status	Likelihood	Contribution
Fugitive dust emissions from excavation/dumping activities during handling of leached ash		RR-CA-00534	Active	Current: Possible (3) Proposed: Possible (3)	37.6% 56.9%

Comments Excavation is undertaken within the Mine Lease Area. However, as this is integral in the handling of leached ash, it is included in the assessment.

The likelihood of this event to extend offsite is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-02336		Confirm the particle size of the leached ash associated with the fugitive dust emissions from excavation/dumping activities.	System Administrator	Proposed	100.0%	Non-Critical Control	6-Oct-2015	Assessed

Risk Control Context Confirm the particle size of the leached ash associated with the fugitive dust emissions from excavation/dumping activities.

Risk Control Comments The implementation of this recommendation will provide additional information and understanding of the cause. As it does not reduce the likelihood of the event occurring, no risk reduction is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00003	Determine the particle size of the leached ash that is associated with the fugitive dust emissions as a result of excavation/dumping activities.		Normal		Pending		N/A



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02725	BC-00431	CPG001M Dust Suppression Control Procedure	No Owner Defined	In Service	100.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Operational Controls for Dust Suppression procedure (TARP)

Risk Control Comments Operational controls and TARPS for dust suppression include:
- alert triggers for fugitive dust thresholds.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Cause	Description	Code	Status	Likelihood	Contribution
	Fugitive dust emissions from mine operation (mining and earth works) due to high wind events (27 km/h)	RR-CA-00535	Active	Current	Possible (3) 12.6%
				Proposed	Possible (3) 19.1%

Comments This event requires dry conditions and winds in excess of ~27 km/hr. Dust generated from the open cut mine will be predominantly PM10.

Mine operations include

- vehicle movement
- open cut mine
- raw coal bunker and
- crusher house

Excavation operations include:

- earth works,
- stripping of topsoil.

AGL conducts progressive mine rehabilitation to minimise the potential fugitive dust emissions.

The likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00068



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02313	BC-00431	CPG001M Dust Suppression Control Procedure	No Owner Defined	In Service	31.0%	Critical Control	Administrative	6-Oct-2015	Good
Base Control Comments	This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Operational Controls for Dust Suppression procedure (TARP)									
Risk Control Comments	Operational controls and TARPS for dust suppression include:									
	- alert triggers for fugitive dust thresholds,									
	- the use of paper mulch,									
	- water sprays,									
	- water carts on roads and									
	- capping dump.									
	These activities only cover certain parts of the mine.									
	The risk control is assessed via the following factors:									
	- Independence: Moderate (part of the Dust Suppression work instruction control)									
	- Applicable: Moderate									
	Based on the above, partial applicability is assigned as it is part of the Dust Suppression work instruction control.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02314	BC-00431	CPG001M Dust Suppression Control Procedure	No Owner Defined	In Service	31.0%	Critical Control	Administrative	6-Oct-2015	Good
Base Control Comments	This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Dust Suppression work instruction (PRWF044M)									
Risk Control Comments	The dust suppression work instruction is interlinked with the operational controls for dust suppressions (TARP).									
	The risk control is assessed via the following factors:									
	- Independence: Moderate (part of the Operational Controls for Dust Suppression procedure (TARP) control)									
	- Applicable: Moderate									
	Based on the above, partial applicability is assigned as it is part of the Operational Controls for Dust Suppression procedure (TARP) control.									

Active Risk Scenarios ID: RR-R-00068



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02732	BC-00431	CPG001M Dust Suppression Control Procedure	No Owner Defined	In Service	31.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Dust source suppression activities

Risk Control Comments Dust suppression activities includes:
 - clay capping
 - mulching
 - progressive mine rehabilitation
 - re-vegetation

These activities target high risk areas, however, not all areas can be suppressed. The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

Based on the above, partial applicability is assigned.

Cause		Code	Status		Likelihood	Contribution
	Fugitive dust emissions from crushed rock used for roads and general civil building activities onsite due to high wind events	RR-CA-00538	Active	Current	Possible (3)	12.1%
				Proposed	Possible (3)	18.3%

Comments This event requires dry conditions and winds in excess of ~27 km/hr. There is a potential that the emission may include PM10 dust and respirable crystalline silica (RCS).

Current results from monitoring of mine emissions indicate that PM10 dust and RCS levels are within the acceptable limits (intervention levels). Therefore, the likelihood of PM10 dust and RCS extending beyond the Mine Lease Area is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00068



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02729	BC-00431	CPG001M Dust Suppression Control Procedure	No Owner Defined	In Service	100.0%	Critical Control	Administrative	6-Oct-2015	Good
Base Control Comments	This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Operational Controls for Dust Suppression procedure (TARP)									
Risk Control Comments	Operational controls and TARPS for dust suppression include:									
	- alert triggers for fugitive dust thresholds,									
	- the use of paper mulch and other remediation works									
	- water sprays.									
	The risk control is assessed via the following factors:									
	- Independence: High									
	- Applicable: Mod-High									
	Based on the above, full applicability is assigned.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02730	BC-00431	CPG001M Dust Suppression Control Procedure	No Owner Defined	In Service	31.0%	Critical Control	Administrative	6-Oct-2015	Good
Base Control Comments	This control establishes expected practices, responsibilities, responses (including TARPs) and predicts the likelihood of dust events.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Dust Suppression work instruction (PRWF044M)(16837)									
Risk Control Comments	The dust suppression work instruction is interlinked with the operational controls for dust suppressions (TARP).									
	The risk control is assessed via the following factors:									
	- Independence: Low (part of the operational controls for dust suppressions (TARP) control.									
	- Applicable: Mod-High									
	Based on the above, partial applicability is assigned as it is part of the operational controls for dust suppressions (TARP) control.									

Cause	Code	Status	Likelihood	Contribution
Fugitive dust emissions due to handling of black coal	RR-CA-00539	Active	Current Unlikely (2)	37.6%
			Proposed Unlikely (2)	5.7%
Comments	Briquettes is no longer handled onsite.			
	Although there is no documented procedure for handling of black coal, offsite emission are not expected as dust emissions is expected to be contained within the site boundary. Therefore, the likelihood of this event is considered to be UNLIKELY.			

Active Risk Scenarios ID: RR-R-00068



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03060		Develop a procedure to manage dust emissions from handling of black coal (update the existing briquette delivery procedure).	No Owner Defined	Proposed	100.0%	Non-Critical Control	13-Oct-2015	Good

Risk Control Context
Develop a procedure to manage dust emissions from handling of black coal (update the existing briquette delivery procedure).

Risk Control Comments
An implemented and effective procedure performed by competent operators to minimise dust emission whilst handling black coal is expected to reduce the risk. Therefore, one order of risk reduction is assigned to this action.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00053	Develop a procedure to manage dust emissions from the handling of black coal (update the existing briquette delivery procedure).		Normal		Pending		N/A

Cause	Description	Code	Status
	Smoke from small fire within the mine operations, general burn off or hotspot (steam/smoke)	RR-CA-00717	Rejected

Comments
Although these causes have the potential to generate some noticeable smoke, the amount of smoke generated is expected to be minor. Therefore, the amenities and/or public health impact is considered to be below level of concerns. Hence this cause is rejected.

Consequences

Consequence	Description	Code	Category	Likelihood	Severity	Risk Rating
	Fugitive dust emissions with the potential to impact public safety	RR-CQ-00450	Public Safety	Current Unlikely (2)	Nuisance event to public safety (no medical attention)	Moderate
				Proposed Unlikely (2)	Nuisance event to public safety (no medical attention)	Moderate

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02727	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments
Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context
Community Engagement Plan

Risk Control Comments
Engagement of stakeholders within the community is the process to inform/manage community issues.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned.

Active Risk Scenarios ID: RR-R-00068



Risk Control Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
RR-COM-03245	BC-00483	Loy Yang Mining Licence 5181 Work Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	16-Oct-2015	Good

Base Control Comments
 The work plan includes:
 - commitments to government on key components on the mine rehabilitation
 - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine
 - outlines progressive mine rehabilitation

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
 Rehabilitated land

Risk Control Comments
 Rehabilitated land will reduce the potential of dust emissions from the mine.

The risk control is assessed via the following factors:
 - Independence: Moderate
 - Applicable: Moderate

Based on the above, conservatively no applicability is assigned.

Risk Control Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
RR-COM-03278		Review the effectiveness of spray coverage and increase the implementation of the automated spray.	No Owner Defined	Proposed	100.0%	Non-Critical Control		13-Oct-2015	Assessed

Risk Control Context
 Review the effectiveness of spray coverage and increase the implementation of the automated spray.

Risk Control Comments
 Implementation of effective and automated spray coverage in high risk areas is expected to reduce dust emissions and has the potential to reduce the risk. However conservatively no future risk reduction is assigned to this action.

Actions Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
RR-A-00060	Review the effectiveness of spray coverage and increase the implementation of the automated spray coverage in high risk areas to reduce dust emissions.		Normal		Pending		N/A

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Loss of amenities due to fugitive dust emissions (visual/nuisance)	RR-CQ-00452	Environment & Community	Current	Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate
			Proposed	Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate

Active Risk Scenarios ID: RR-R-00068



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03059	BC-00408	Environmental site plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	13-Oct-2015	Average	
Base Control Comments	<p>The plan specifies the allowable discharge limits as referenced in the EPA licence 11149 conditions.</p> <p>This includes ongoing visual inspection and remediation of targeted areas following the hydrological model and monitoring.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Fair - Monitoring/Auditing: None <p>Based on the above, the effectiveness is assessed to be AVERAGE.</p>										
Risk Control Context	Monitoring of air emissions and exposure levels										
Risk Control Comments	<p>Data from monitoring the air emissions is used to inform the operational controls and mine rehabilitation plans. AGL has installed numerous air monitoring stations which assist and validate complaints.</p> <p>The monitoring occurs after the event has occurred.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Low (monitoring occurs after the event). <p>Based on the above, no applicability is assigned.</p>										
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03063		Review the effectiveness of spray coverage and increase the implementation of the automated spray.	No Owner Defined	Proposed	100.0%	Non-Critical Control		13-Oct-2015	Assessed	
Risk Control Context	Review the effectiveness of spray coverage and increase the implementation of the automated spray.										
Risk Control Comments	Implementation of effective and automated spray coverage in high risk areas is expected to reduce dust emissions and has the potential to reduce the risk. However conservatively no future risk reduction is assigned to this action.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00058	Review the effectiveness of spray coverage and increase the implementation of the automated spray coverage in high risk areas to reduce dust emissions.					Normal		Pending		N/A
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03064		Investigate the use of Compressed Air Foam (CAF) for dust suppressions.	No Owner Defined	Proposed	100.0%	Non-Critical Control		13-Oct-2015	Assessed	
Risk Control Context	Investigate the use of Compressed Air Foam (CAF) for dust suppressions.										
Risk Control Comments	The implementation of this recommendation will provide additional information to the cause. As this does not reduce the likelihood of the event from occurring, no risk reduction is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00059	Investigate the use of Compressed Air Foam (CAF) for dust suppressions.					Normal		Pending		N/A



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03246	BC-00483	Loy Yang Mining Licence 5181 Work Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	16-Oct-2015	Good

Base Control Comments
 The work plan includes:
 - commitments to government on key components on the mine rehabilitation
 - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine
 - outlines progressive mine rehabilitation

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
 Rehabilitated land

Risk Control Comments
 Rehabilitated land will reduce the potential of dust emissions from the mine.

The risk control is assessed via the following factors:
 - Independence: Moderate
 - Applicable: Moderate

Based on the above, conservatively no applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Noise emissions**

Scenario **Mining operations generating noise which could cause nuisance or loss of amenity**

Comments Recommended levels by SEPP (Noise from industry in regional Victoria 2011) (NIRV):

Day: 45 dB(A)
 Evening: 37 dB(A)
 Night: 32 db(A)

Due to noise emissions, there is the risk that noise incidents result in verified complaints from local residents.

The noise emissions are not expected to result in hearing damage to members of the public. Therefore, no risk to public safety was identified.

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current		Unlikely (2)		Environment & Community	Level 3	(1.5)		Moderate	
Proposed		Unlikely (2)		Environment & Community	Level 3	(1.5)		Moderate	

Causes

Cause	Noise emissions from mining related activities	Code	Status	Likelihood	Contribution
		RR-CA-00421	Active	Current Possible (3)	100.0%
				Proposed Possible (3)	100.0%

Comments Potential sources include:
 - dredgers
 - stackers
 - conveyors
 - crushing plant
 - mobile plant (heavy machinery)
 - drilling

Most of the equipment operated onsite is not expected to generate noise emissions greater than 85 dBa. Therefore, the likelihood of this event is considered to be POSSIBLE.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-01998	BC-00452	Buffer zone between site and residences	No Owner Defined	In Service	100.0%	Critical Control	Isolation	5-Oct-2015	Good
Base Control Comments	<p>Exclusion Zones 0110 code. Planning controls mandate buffer zones between the site and residences to minimise the number of potential receptors. Tree planting and screening within the buffer zones. This land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license. The planning zone ultimately results in reduced population, i.e. reduced human activity in this zone.</p> <p>The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. These activities include farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.</p> <p>Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria.</p> <p>Exclusion zones around electrical infrastructure</p> <p>The base control is assessed via the following: - Implemented: Yes - Type: Administrative (some aspects of isolation) - Reliability: Very Good - Monitoring/Auditing: Ad-hoc</p> <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Buffer zone between site and residences									
Risk Control Comments	<p>Buffer zone provides distance between the mine and potential receptors.</p> <p>The risk control is assessed via the following factors: - Independence: Moderate - Applicable: Mod-High</p> <p>Based on the above, full applicability is assigned.</p>									

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Noise emissions with the potential to result in nuisance and/or loss of amenity to the local community	RR-CQ-00351	Environment & Community	Current	Unlikely (2) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate
			Proposed	Unlikely (2) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate

Active Risk Scenarios ID: RR-R-00069



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02634	BC-00453	Maintain noise signature model	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	7-Oct-2015	Assessed

Base Control Comments This aids in response to noise emitted from the mine site.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be ASSESSED.

Risk Control Context Maintain noise signature model

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Low
- Applicable: Moderate

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02635	BC-00424	Complaints Registry Procedure (P00063)	No Owner Defined	In Service	0.0%	Non-Critical Control	Procedural	7-Oct-2015	Assessed

Base Control Comments Process that administers issues raised via community complaints.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be ASSESSED.

Risk Control Context Complaints Registry Procedure (P00063)

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Low
- Applicable: Moderate

Based on the above, no applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Visual light emissions**

Scenario **Mining operations generating light emissions which could cause nuisance or loss of amenity**

Comments Recommended levels by SEPP (Noise from industry in regional Victoria 2011) (NIRV):

Day: 45 dB(A)
 Evening: 37 dB(A)
 Night: 32 dB(A)

Due to noise emissions there is the risk that noise incidents result in verified complaints from local residents.

Ratings Qualitative (Automatically Calculated)

Top Event	Likelihood	Consequence	Category	Consequence Severity	Max Consequence Risk
Current	Rare (1)	Environment & Community		Level 1 (0.5)	Low
Proposed	Rare (1)	Environment & Community		Level 1 (0.5)	Low

Causes

Cause	Light emissions from mining related activities	Code	Status	Likelihood	Contribution
		RR-CA-00690	Active	Current: Unlikely (2) Proposed: Unlikely (2)	100.0% 100.0%

Comments The site activities emit light. However, none of these are significant to the point of generating community complaints. Therefore, the likelihood of this event is considered to be UNLIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03066	BC-00452	Buffer zone between site and residences	No Owner Defined	In Service	100.0%	Critical Control	Isolation	5-Oct-2015	Good

Base Control Comments Exclusion Zones 0110 code. Planning controls mandate buffer zones between the site and residences to minimise the number of potential receptors. Tree planting and screening within the buffer zones. This land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license. The planning zone ultimately results in reduced population, i.e. reduced human activity in this zone.

The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. These activities include farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.

Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria.

Exclusion zones around electrical infrastructure

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative (some aspects of isolation)
- Reliability: Very Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Buffer zone between site and residences

Risk Control Comments Buffer zone provides distance between the mine and potential receptors. (Issues are not expected from members of the public utilising the roads that travel through the mine lease).

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Consequences



Consequence	Code	Category	Likelihood	Severity	Risk Rating
Visual light emissions with the potential to result in nuisance and/or loss of amenity	RR-CQ-00545	Environment & Community	Current	Rare (1) Negligible and short term environmental impact to localised area of Negligible environmental value. No impact beyond AGL's operational area. No interest by local community.	Low
			Proposed	Rare (1) Negligible and short term environmental impact to localised area of Negligible environmental value. No impact beyond AGL's operational area. No interest by local community.	Low

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03065	BC-00424	Complaints Registry Procedure (P00063)	No Owner Defined	In Service	0.0%	Non-Critical Control	Procedural	7-Oct-2015	Assessed

Base Control Comments Process that administers issues raised via community complaints.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be ASSESSED.

Risk Control Context Complaints Registry Procedure (P00063)

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Low
- Applicable: Moderate

Based on the above, no applicability is assigned.

Risk Scenario Details

Status Active

Top Event **Post rehabilitation/fire**

Scenario **Post closure of mine future hazards which could impact the environment or public safety**

Comments Issue 1:

For the lake to be successfully filled, water must be granted to AGL through two licences for extraction of groundwater and the provision of bulk water from the La Trobe river. This is dependent on a third party. The consequence and likelihood of inadequate water for lake filling and weight balance cannot be determined, as this is dependent on the two governing bodies providing approval to grant licences.

Issue 2:

Issues around poor lake quality include:

- pH (acid rock drainage)
- aquifer pressure rebound sooner than anticipated
- adverse colour

Poor lake quality is expected to be contained within the Mine Lease Area. For it to escalate beyond the Mine Lease Area would require an interchange between the aquifers and the lake.

The likelihood of offsite and adverse environmental impact cannot be assessed without further investigation.

Ratings Qualitative (Automatically Calculated)

Proposed	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
		Unlikely (2)		Public Safety		Level 5 (5)			High
Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking	
	RR-A-00037	Undertake an assessment to determine the likelihood and impacts of poor lake water quality to regional aquifers as a result of interchange with the lake.		Normal		Pending		N/A	

Causes

Cause	Code	Status	Likelihood	Contribution
Insufficient topsoil to complete final rehabilitation for the open cut mine	RR-CA-00600	Active	Current Rare (1)	25.0%
			Proposed Possible (3)	7.7%

Comments Unsuccessful rehabilitation may contribute to erosion and water quality issueS that may result in water runoff. This water runoff due to acid mine drainage has the potential for higher consequence impact and been considered in RR-R-00063.

It has been identified that there may be insufficient topsoil to successfully complete final rehabilitation. This is expected to be contained within the Mine Lease Area. Therefore, the future likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-02479		Loy Yang Mining Licence 5181 Work Plan Variation	System Administrator	Proposed	100.0%	Non-Critical Control	7-Oct-2015	Good

Risk Control Context Loy Yang Mining Licence 5181 Work Plan Variation

Risk Control Comments Program to stockpile topsoil. Program to detail how to apply closure plan in relation to water management post mine closure. The work plan variation includes:
- commitments to government on key components on the mine rehabilitation
- the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine

Once this plan is approved and implemented, it is expected to be an effective control. Therefore the future effectiveness is assessed to be GOOD.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00071



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment		
	RR-COP-02481		Continue to investigate alternative sources of topsoil, or alternative materials (include 4 year investigation on artificial topsoil study with Federation University).	System Administrator	Proposed	100.0%	Non-Critical Control	7-Oct-2015	Good		
Risk Control Context	Continue to investigate alternative sources of topsoil, or alternative materials (include 4 year investigation on artificial topsoil study with Federation University).										
Risk Control Comments	Once an alternate topsoil is identified, it is expected to eliminate the issues associated with the cause, therefore it is expected that this would provide one order of future risk reduction. Therefore effectiveness is considered to be GOOD.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00052	Continue to investigate alternative sources of topsoil, or alternative materials (include 4 year investigation on artificial topsoil study with Federation University).					Normal		Pending		N/A

Cause	Description	Code	Status	Likelihood	Contribution
	Ground subsidence of rehabilitated landform post mining operations	RR-CA-00647	Active	Rare (1)	25.0%
				Possible (3)	7.7%
Comments	Potential pathways include: - groundwater extraction - adverse jointing arrangements - excessive infiltration of water into batter cracks and joints (increase pore pressures) - saturated soils - material quality issues The future likelihood of this event is considered to be POSSIBLE.				

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment		
	RR-COP-03144		Develop and implement the Mine Closure Plan	No Owner Defined	Proposed	100.0%	Non-Critical Control	14-Oct-2015	Good		
Risk Control Context	Develop and implement the Mine Closure Plan										
Risk Control Comments	This Mine Closure Plan (draft) has post closure monitoring, trigger levels and associated tactical response. The plan also sets the completion and success criteria for complete rehabilitation.										
	Once this plan is approved and implemented, it is expected to be an effective control. Therefore the future effectiveness is assessed to be GOOD.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment		
	RR-COP-03275		Loy Yang Mining Licence 5181 Work Plan Variation	No Owner Defined	Proposed	100.0%	Non-Critical Control	23-Oct-2015	Good		
Risk Control Context	Loy Yang Mining Licence 5181 Work Plan Variation										
Risk Control Comments	Program to stockpile topsoil. Program to detail how to apply closure plan in relation to water management post mine closure. The work plan variation includes: - commitments to government on key components on the mine rehabilitation - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine										
	Once this plan is approved and implemented, it is expected to be an effective control. Therefore the future effectiveness is assessed to be GOOD.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.					Normal		Pending		N/A



Cause	Code	Status	Likelihood	Contribution
Acid mine drainage from the overburden dump impacting Traralgon Creek water quality	RR-CA-00649	Active	Current Rare (1)	25.0%
			Proposed Possible (3)	7.7%

Comments Potential pathways include:
 - exposed sulphites within excavated material to rainwater and surface water
 - incomplete clay capping
 - geotechnical instability in the area

The future likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03146		Develop and implement the Mine Closure Plan	No Owner Defined	Proposed	100.0%	Non-Critical Control	14-Oct-2015	Good

Risk Control Context Develop and implement the Mine Closure Plan

Risk Control Comments This Mine Closure Plan (draft) has post closure monitoring, trigger levels and associated tactical response. The plan also sets the completion and success criteria for complete rehabilitation.

Once this plan is approved and implemented, it is expected to be an effective control. Therefore the future effectiveness is assessed to be GOOD.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03276		Loy Yang Mining Licence 5181 Work Plan Variation	No Owner Defined	Proposed	100.0%	Non-Critical Control	23-Oct-2015	Good

Risk Control Context Loy Yang Mining Licence 5181 Work Plan Variation

Risk Control Comments Program to stockpile topsoil. Program to detail how to apply closure plan in relation to water management post mine closure. The work plan variation includes:
 - commitments to government on key components on the mine rehabilitation
 - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine

Once this plan is approved and implemented, it is expected to be an effective control. Therefore the future effectiveness is assessed to be GOOD.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Fire risk during mine closure progress	RR-CA-00652	Active	Current Rare (1)	25.0%
			Proposed Likely (4)	76.9%

Comments Potential pathways includes:
 - smoking
 - spontaneous combustion
 - uncontrolled ignition sources from farming equipment or farming related activities
 - electrical source of ignition
 - hot works
 - light or heavy equipment
 - arsons

Bush fire hazards are managed by other authorities. Bush fire has occurred in Victoria, therefore the future likelihood for a bush fire or ember attack to directly affect the mine is considered to be LIKELY.

Active Risk Scenarios ID: RR-R-0071



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03152		Develop and implement the Mine Closure Plan	No Owner Defined	Proposed	100.0%	Non-Critical Control	14-Oct-2015	Good
Risk Control Context	Develop and implement the Mine Closure Plan								
Risk Control Comments	This Mine Closure Plan (draft) has post closure monitoring, trigger levels and associated tactical response. The plan also sets the completion and success criteria for complete rehabilitation.								
Actions	Once this plan is approved and implemented, it is expected to be an effective control. Therefore the future effectiveness is assessed to be GOOD.								
	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking	
	RR-A-00036	Develop and implement the Mine Closure Plan. This should include post closure monitoring, trigger levels and associated tactical response. The plan should also set the completion and success criteria for complete rehabilitation.		Normal		Pending		N/A	

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03277		Loy Yang Mining Licence 5181 Work Plan Variation	No Owner Defined	Proposed	100.0%	Non-Critical Control	23-Oct-2015	Good
Risk Control Context	Loy Yang Mining Licence 5181 Work Plan Variation								
Risk Control Comments	Program to stockpile topsoil. Program to detail how to apply closure plan in relation to water management post mine closure. The work plan variation includes: - commitments to government on key components on the mine rehabilitation - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine								
Cause	Insufficient topsoil to complete final rehabilitation for overburden dump								
				Code	Status				
				RR-CA-00727	Rejected				
Comments	There is sufficient quantity of topsoil to complete final rehabilitation of the overburden dump. Therefore, this cause is rejected.								

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Environmental impacts from unsuccessful rehabilitation - Land, Aquifer and Surface Water	RR-CQ-00306	Environment & Community	Current	Rare (1)	Low
			Proposed	Unlikely (2)	Moderate
Fire risk with the potential to impact public safety	RR-CQ-00558	Public Safety	Current	Rare (1)	High

Active Risk Scenarios ID: RR-R-00071



Proposed	Rare (1)	Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High
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Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03156		Vic police and CFA Response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed
Risk Control Context	Vic police and CFA Response									
Risk Control Comments	External emergency responders will initiate various plans and protocols in response to a major fire to minimise the risk to public health and property. The CFA will be required to treat the rehabilitated area no differently to the surrounding land uses.									
Although this is an effective and applicable control, the adequacy is not assessed as it is a third party control.										

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03166		Rehabilitation Fire Suppression Systems	No Owner Defined	Proposed	100.0%	Non-Critical Control		14-Oct-2015	Good
Risk Control Context	Rehabilitation Fire Suppression Systems									
Risk Control Comments	The fire suppression equipment is expected to include a pump station which sources water from the base of the mine and a reticulated system of spraylines to protect exposed coal surfaces. The system is expected to be manually activated.									
Once this is implemented, it is expected to provide one order of future risk reduction. Therefore effectiveness is considered to be GOOD.										

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00057	Post mining closure, install a fire suppression system to prevent and/or mitigate against a mine fire. The system should include a pump station that sources water from the base of the mine and a reticulated system of spray lines to protect exposed coal surfaces. The system can be manually activated.		Normal		Pending		N/A

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Environmental risk from smoke with the potential to impact public amenities	RR-CQ-00559	Environment & Community	Current	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low
			Proposed	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03159		Vic police and CFA Response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed
Risk Control Context	Vic police and CFA Response									
Risk Control Comments	External emergency responders will initiate various plans and protocols in response to a major fire to minimise the risk to public health and property. The CFA will be required to treat the rehabilitated area no differently to the surrounding land uses.									
Although this is an effective and applicable control, the adequacy is not assessed as it is a third party control.										

Active Risk Scenarios ID: RR-R-00071



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03164		Rehabilitation Fire Suppression Systems	No Owner Defined	Proposed	100.0%	Non-Critical Control		14-Oct-2015	Good	
Risk Control Context	Rehabilitation Fire Suppression Systems										
Risk Control Comments	The fire suppression equipment is expected to include a pump station which sources water from the base of the mine and a reticulated system of spraylines to protect exposed coal surfaces. The system is expected to be manually activated.										
Once this is implemented, it is expected to provide one order of future risk reduction. Therefore effectiveness is considered to be GOOD.											
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00057	Post mining closure, install a fire suppression system to prevent and/or mitigate against a mine fire. The system should include a pump station that sources water from the base of the mine and a reticulated system of spray lines to protect exposed coal surfaces. The system can be manually activated.					Normal		Pending		N/A

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Smoke risk with the potential to impact the public safety	RR-CQ-00560	Public Safety	Current	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High
			Proposed	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03154		Vic police and CFA Response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed
Risk Control Context	Vic police and CFA Response									
Risk Control Comments	External emergency responders will initiate various plans and protocols in response to a major fire to minimise the risk to public health and property. The CFA will be required to treat the rehabilitated area no differently to the surrounding land uses.									
Although this is an effective and applicable control, the adequacy is not assessed as it is a third party control.										

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COM-03165		Rehabilitation Fire Suppression Systems	No Owner Defined	Proposed	100.0%	Non-Critical Control		14-Oct-2015	Good	
Risk Control Context	Rehabilitation Fire Suppression Systems										
Risk Control Comments	The fire suppression equipment is expected to include a pump station which sources water from the base of the mine and a reticulated system of spraylines to protect exposed coal surfaces. The system is expected to be manually activated.										
Once this is implemented, it is expected to provide one order of future risk reduction. Therefore effectiveness is considered to be GOOD.											
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00057	Post mining closure, install a fire suppression system to prevent and/or mitigate against a mine fire. The system should include a pump station that sources water from the base of the mine and a reticulated system of spray lines to protect exposed coal surfaces. The system can be manually activated.					Normal		Pending		N/A

Risk Scenario Details

Status Active

Top Event **Hazardous chemicals**

Scenario **Loss of containment of chemicals which could impact the environment**

Comments

This includes the following areas:

1. Northern OB retention pond polymer & lime dosing area
2. Freight gate - physical bunding, oil in 1000 L aboveground being transferred and tanked petrol & diesel belowground
3. Behind the Freight Gate is the Fuel Depot, transfer points of oil, diesel and petrol
4. RTL Yards - bunded area, triple intercepted pits - transfer point for oil pods

A spill of polymer or lime is not expected to result in an environmental impact of concern. In addition, it is not expected to extend beyond the Mine Lease Area. The polymer dosing station is upstream of the OB pond and settlement ponds, any spill will be significantly diluted by these two water bodies. Therefore, hazards associated with a spill of polymer or lime are not considered a credible cause of concern. This assessment will consider spills associated with petrol, diesel and/or oil.

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max	Consequence	Risk
Current		Possible (3)		Environment & Community		Level 3 (1.5)		Moderate	
Proposed		Possible (3)		Environment & Community		Level 3 (1.5)		Moderate	

Causes

Cause	Code	Status	Likelihood	Contribution
Spill during unloading due to maloperation	RR-CA-00697	Active	Possible (3)	6.3%
			Possible (3)	0.8%

Comments Hazardous chemical which includes: oil, petrol, diesel. A spill can occur due to operator error during unloading, i.e. valve left open etc. Therefore, the likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02947	BC-00476	HSW707 Unloading of Bulk Chemical Tankers Work Instruction	No Owner Defined	In Service	0.0%	Critical Control	Administrative	6-Oct-2015	Good

Base Control Comments The procedure includes appropriate steps and precautions to be undertaken to minimise the potential of a spill during bulk tanker unloading.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Procedure for unloading of bulk chemical (generic)

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Low (included in cause likelihood)
- Applicable: Moderate

Based on the above, no applicability is assigned as the control is not independent of the cause.

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02956	BC-00477	Bunding	No Owner Defined	In Service	100.0%	Critical Control	Engineering	6-Oct-2015	Good

Base Control Comments
Existing bunding within the mine lease area is assessed to be in an appropriate condition to contain a spill.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
Deliveries undertaken within a bunded area.

Risk Control Comments
Bunding is expected to contain and hence mitigate a release in the event of a spill during unloading.

The risk control is assessed via the following factors:
 - Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347)		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-02966		Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding.	No Owner Defined	Proposed	100.0%	Non-Critical Control	14-Oct-2015	Good

Risk Control Context
Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding.

Risk Control Comments
Existing bunding has been assigned as "Good" and full applicability; hence it is expected to reduce the likelihood of the event by one order of magnitude.

Bunding that is compliant with AS1940 and EPA guidelines and maintained accordingly will provide an overall likelihood reduction of two orders of magnitude. Hence, once this action is completed, it is expected that this control would provide an additional order of risk reduction. Therefore, the future effectiveness is considered to be GOOD.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347)		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Spill during unloading due to hose failure	RR-CA-00698	Active	Current Possible (3)	6.3%
			Proposed Possible (3)	0.8%

Comments
Contaminated water leaving site due to a surface spill of chemicals. This includes hydrocarbon (diesel/petrol) and oil.

Potential pathways include:
 - wear and tear
 - drive away

The likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03168	BC-00476	HSW707 Unloading of Bulk Chemical Tankers Work Instruction	No Owner Defined	In Service	0.0%	Critical Control	Administrative	6-Oct-2015	Good
Base Control Comments	The procedure includes appropriate steps and precautions to be undertaken to minimise the potential of a spill during bulk tanker unloading. The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Procedure for unloading of bulk chemical (generic)									
Risk Control Comments	The risk control is assessed via the following factors: - Independence: Low (included in cause likelihood) - Applicable: Moderate Based on the above, no applicability is assigned as control is not independent of the cause.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03169	BC-00477	Bundling	No Owner Defined	In Service	100.0%	Critical Control	Engineering	6-Oct-2015	Good
Base Control Comments	Existing bundling within the mine lease area is assessed to be in an appropriate condition to contain a spill. The base control is assessed via the following: - Implemented: Yes - Type: Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Deliveries undertaken within a bunded area.									
Risk Control Comments	Bundling is expected to contain and hence mitigate the spill in the event of a spill during unloading. The risk control is assessed via the following factors: - Independence: High - Applicable: High Based on the above, full applicability is assigned.									

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347)		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment	
	RR-COP-03170		Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding.	No Owner Defined	Proposed	100.0%	Non-Critical Control	14-Oct-2015	Good	
Risk Control Context	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding.									
Risk Control Comments	Existing bunding has been assigned as "Good" and full applicability; hence it is expected to reduce the likelihood of the event by one order of magnitude. Bunding that is compliant with AS1940 and EPA guidelines and maintained accordingly will provide an overall likelihood reduction of two orders of magnitude. Hence, once this action is completed, it is expected that this control would provide an additional order of risk reduction. Therefore, the future effectiveness is considered to be GOOD.									

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking

Active Risk Scenarios ID: RR-R-00072



RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347)		Normal	Pending	N/A
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Cause	Spill due to tanker accident	Code	Status		Likelihood	Contribution				
		RR-CA-00700	Active		Current Unlikely (2)	6.3%				
					Proposed Unlikely (2)	7.5%				
Comments	Bulk tanker delivery error. This could result in a contaminated surface discharge of hazardous chemicals, which includes oil, petrol and diesel. The likelihood of a spill as a result of a tanker accident is expected to be UNLIKELY considering typical road rule controls (speed limits, licenced driver, road design etc) implemented onsite.									
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02951	BC-00478	Third party chemical suppliers	No Owner Defined	In Service	0.0%	Critical Control	Administrative	11-Oct-2015	Average
Base Control Comments	The site engages chemical suppliers that comply with the Australian Dangerous Goods (ADG) codes.									
	The base control is assessed via the following: - Implemented: Part (Third party control) - Type: Administrative - Reliability: Good - Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be AVERAGE.									
Risk Control Context	Competent and reputable third party tanker drivers									
Risk Control Comments	The risk control is assessed via the following factors: - Independence: Low (Considered in cause likelihood) - Applicable: Moderate									
	Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.									
Actions	Code	Objective	Work to be Done		Priority	Implementer	Status	Complete By	Tracking	
	RR-A-00039	Verify that third party chemical transport companies comply with the relevant Australian Dangerous Goods codes.			Normal		Pending		N/A	

Cause	Failure of underground storage tank from corrosion resulting in groundwater contamination	Code	Status		Likelihood	Contribution				
		RR-CA-00702	Active		Current Possible (3)	6.3%				
					Proposed Possible (3)	7.5%				
Comments	The underground storage tanks include diesel and petrol tanks. There is a potential for an underground leak from these tanks. The likelihood of this event is considered to be POSSIBLE.									
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment	
	RR-COP-02941		Ensure that the underground storage tanks are compliant with the Vic EPA UPSS guidelines.	No Owner Defined	Proposed	100.0%	Non-Critical Control	6-Oct-2015	Assessed	
Risk Control Context	Ensure that the underground storage tanks are compliant with the Vic EPA UPSS guidelines.									
Risk Control Comments	Three underground tanks (one petrol and two diesel) are located near the Freight Gate. The implementation of this recommendation will provide ongoing assurance that the storage tanks are compliant with the appropriate guidelines. Therefore, no risk reduction is assigned.									
Actions	Code	Objective	Work to be Done		Priority	Implementer	Status	Complete By	Tracking	
	RR-A-00056	Ensure that the underground storage tanks (one petrol and two diesel) near the Freight Gate are compliant with the Vic EPA UPSS guidelines.			Normal		Pending		N/A	

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03178	BC-00479	Maintenance Routine - Tanks	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments Inspections of aboveground and underground storage tanks is undertaken in line with the relevant standards.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc (Annual performance statement audit undertaken by an EPA auditor)

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Maintenance routine - Tanks

Risk Control Comments The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00040	Confirm the integrity testing regime for the above and below ground storage tanks.		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Tank overflow due to maloperation	RR-CA-00703	Active	Possible (3)	6.3%
			Proposed	0.8%

Comments A tank overflow can occur due to operator error during unloading, i.e. incorrect ullage calculation etc. Therefore, the likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03172	BC-00476	HSW707 Unloading of Bulk Chemical Tankers Work Instruction	No Owner Defined	In Service	0.0%	Critical Control	Administrative	6-Oct-2015	Good

Base Control Comments The procedure includes appropriate steps and precautions to be undertaken to minimise the potential of a spill during bulk tanker unloading.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Procedure for unloading of bulk chemical (generic)

Risk Control Comments This includes checking the daily tank levels records.

- The risk control is assessed via the following factors:
- Independence: Low (included in cause likelihood)
 - Applicable: Moderate

Based on the above, no applicability is assigned as the control is not independent of the cause.

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03179	BC-00477	Bunding	No Owner Defined	In Service	100.0%	Critical Control	Engineering	6-Oct-2015	Good

Base Control Comments Existing bunding within the mine lease area is assessed to be in an appropriate condition to contain a spill.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Deliveries undertaken within a bunded area.

Risk Control Comments Bunding is expected to contain and hence mitigate a release in the event of overfill.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347)		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03180		Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding.	No Owner Defined	Proposed	100.0%	Non-Critical Control	14-Oct-2015	Good

Risk Control Context Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347) and a program is implemented to maintain the integrity of the bunding.

Risk Control Comments Existing bunding has been assigned as "Good" and full applicability; hence it is expected to reduce the likelihood of the event by one order of magnitude.

Bunding that is compliant with AS1940 and EPA guidelines and maintained accordingly will provide an overall likelihood reduction of two orders of magnitude. Hence, once this action is completed, it is expected that this control would provide an additional order of risk reduction. Therefore, the future effectiveness is considered to be GOOD.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00038	Verify that the bunding of hazardous chemicals is compliant with AS1940 and EPA guidelines (EPA Publication 347)		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Spill whilst using mobile fill points	RR-CA-00704	Active	Possible (3)	62.5%
			Possible (3)	75.2%

Comments Hazardous chemical which includes: oil, petrol, diesel. A spill can occur due to operator error during unloading, i.e. valve left open etc. Therefore, the likelihood of this event is considered to be POSSIBLE.

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03171	BC-00480	Third party contractor RTL - Refuelling of Mobile Plant (RTL-OPS-WI-021)	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	6-Oct-2015	Average

Base Control Comments The refuelling of mobile plant is undertaken by a third party (RTL & Production Support Group).

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Third party contractor RTL - Refuelling of Mobile Plant (RTL-OPS-WI-021)

Risk Control Comments The refuelling of mobile plant is undertaken by third party (RTL & Production Support Group).

The risk control is assessed via the following factors:

- Independence: Low (Considered in cause likelihood).
- Applicable: Moderate

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Cause	Code	Status	Likelihood	Contribution
Spill due to corrosion of aboveground tank	RR-CA-00705	Active	Current	Possible (3) 6.3%
			Proposed	Possible (3) 7.5%

Comments The aboveground storage tanks include an oil tank. There is potential for an underground leak from these tanks. The likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03181	BC-00479	Maintenance Routine - Tanks	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments Inspections of aboveground and underground storage tanks is undertaken in line with the relevant standards.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Ad-hoc (Annual performance statement audit undertaken by an EPA auditor)

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Maintenance routine - Tanks

Risk Control Comments The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00040	Confirm the integrity testing regime for the above and below ground storage tanks.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment	
	RR-COP-03182		Ensure that the underground storage tanks are compliant with the Vic EPA UPSS guidelines.	No Owner Defined	Proposed	100.0%	Non-Critical Control	6-Oct-2015	Assessed	
Risk Control Context	Ensure that the underground storage tanks are compliant with the Vic EPA UPSS guidelines.									
Risk Control Comments	Three underground tanks (one petrol and two diesel) are located near the Freight Gate. The implementation of this recommendation will provide ongoing assurance that the storage tanks are compliant with the appropriate guidelines. Therefore, no risk reduction is assigned.									
Actions	Code	Objective	Work to be Done			Priority	Implementer	Status	Complete By	Tracking
	RR-A-00056	Ensure that the underground storage tanks (one petrol and two diesel) near the Freight Gate are compliant with the Vic EPA UPSS guidelines.				Normal		Pending		N/A

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Contaminated water discharge with the potential to impact the environment	RR-CQ-00547	Environment & Community	Current	Unlikely (2) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate
			Proposed	Unlikely (2) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Moderate

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03183	BC-00409	Monitoring equipment L171, alarm and operator response	No Owner Defined	In Service	31.0%	Critical Control	Administrative	7-Oct-2015	Good
Base Control Comments	The equipment continuously monitor pH, turbidity, temperature and conductivity. Operator periodically monitors the systems and responds to alarms. The base control is assessed via the following: - Implemented: Yes - Type: Administrative/Engineering - Reliability: Good - Monitoring/Auditing: Performance monitoring Based on the above, the effectiveness of the control is assessed as GOOD.									
Risk Control Context	Alarm and operator response									
Risk Control Comments	Not all spills would discharge through L171. The risk control is assessed via the following factors: - Independence: Moderate - Applicable: Moderate (not all spills discharge through L171). Based on the above, partial applicability is assigned.									
Actions	Code	Objective	Work to be Done			Priority	Implementer	Status	Complete By	Tracking
	RR-A-00023	Install an upgraded SCADA on-line monitoring and dosing equipment (Automate operation of settling pond and O/B valves).				Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00072



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03184	BC-00410	Weekly sampling at discharge point L171 and L160	No Owner Defined	In Service	0.0%	Non-Critical Control		7-Oct-2015	Assessed
Base Control Comments	Third party sampling analysis of monitoring equipment L160 and L171 on a weekly basis. This control provides assurance that the system is functioning.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Ad-hoc									
	Based on the above, the effectiveness of the control is assessed to be ASSESSED.									
Risk Control Context	Independent third party sampling									
Risk Control Comments	The risk control is assessed via the following factors:									
	- Independence: High									
	- Applicable: Low (sampling is undertaken weekly at which in this time a spill may have already occurred).									
	Based on the above, no applicability is assigned.									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03185	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good
Base Control Comments	The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:									
	- Vic police									
	- EPA									
	- West Gippsland Catchment Management Authority									
	- Gippsland Water and									
	- Department of Health etc.									
	The base control is assessed via the following:									
	- Implemented: Yes									
	- Type: Administrative									
	- Reliability: Good									
	- Monitoring/Auditing: Performance monitoring									
	Based on the above, the effectiveness of the control is assessed to be GOOD.									
Risk Control Context	Emergency Management Plan									
Risk Control Comments	Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.									
	The risk control is assessed via the following factors:									
	- Independence: Moderate									
	- Applicable: Moderate									
	Based on the above, partial applicability is assigned.									

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Contaminated land with the potential to impact the environment	RR-CQ-00562	Environment & Community	Current Unlikely (2)	Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community.	Moderate



Proposed Unlikely (2) Small scale and short term environmental impact to localised area of low environmental value. No impact beyond AGL's operational area. No/minor interest by local community. **Moderate**

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03186	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Management Plan

Risk Control Comments Some of these hazardous events may trigger incident response as per the Emergency Response Procedure which will be determined by the incident controller.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

Based on the above, partial applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Mine fire**

Scenario **Significant fire within/near the Mine lease area which may impact public safety and the environment**

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence Severity	Max Consequence Risk
Current	Unlikely (2)		Public Safety		Level 5 (5)	High
Proposed	Unlikely (2)		Public Safety		Level 5 (5)	High

Causes

Cause	Description	Code	Status	Likelihood	Contribution
	Hot surface temperature of brakes on conveyors, dredgers/stackers	RR-CA-00610	Active	Current: Likely (4) Proposed: Likely (4)	0.2% 0.2%

Comments Thruster failure and/or failure to adjust are typical causes of hot surface temperature on a dredger.

This includes the Raw Coal Bunker and Crusher House.

Likelihood include consideration that brake unit design is fit for purpose and meets standards, OEM documentation (OEM's).

In the past 3 years (2012-2015), 2 of the 41 smouldering coal/fire events have been attributed to brake failure. The likelihood of this event is considered to be LIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02751	BC-00470	Detection and suppression on conveyor lines	No Owner Defined	In Service	100.0%	Critical Control	Engineering	8-Oct-2015	Average

Base Control Comments Some of the equipment will have automated detection and suppression on coal delivering structure. Other equipment items are reliant on activation of the manual fire suppression systems.

The Raw Coal Bunker and Crusher House fire detection and suppression system includes:
 - Very Early Smoke Detection Alarm
 - Thermal imaging cameras
 - Manual deluge (operator initiated)

The base control is assessed via the following:
 - Implemented: Part (fully implemented on the rising conveyors)
 - Type: Administrative/Engineering
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Detection and suppression on conveyor lines

Risk Control Comments Some of the equipment will have automated detection and suppression. Other equipment items are reliant on activation of the manual fire suppression systems.

The risk control is assessed via the following factors:
 - Independence: Mod-High
 - Applicable: High

Based on the above, full applicability is assigned.

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-02759	Probability of initial fire escalating	Active	Current: Unlikely (2) Proposed: Unlikely (2)	Rare (1) Rare (1)	0.1% 0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02764	BC-00151	General Housekeeping	No Owner Defined	In Service	100.0%	Non-Critical Control	Administrative	1-Sep-2015	Assessed

Base Control The housekeeping removes fuel (coal, grease, oil) around hot components, i.e. potential ignition sources.

Comments

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be ASSESSED.

Risk Control Work area inspection will trigger the cleaning procedure
Context

Risk Control The procedure reduces the potential for fuel to come into contact with hot surfaces on the mobile plant thus reducing the potential for a fire.
Comments

General cleaning does not always extend to the required depth. It removes bulk coal material but often, layers of grease and oil may remain. Specialist cleaning utilising degreasing agents and pressurised steam may be required.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03117	BC-00469	Mechanical Maintenance Routine	No Owner Defined	In Service	0.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Preventative maintenance program is designed to maintain equipment to minimise integrity related problems / and or unexpected failure.

Comments

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and Audited

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Maintenance routine on all brakes
Context

Risk Control The risk control is assessed via the following factors:
Comments

- Independence: Low (Considered in cause likelihood)
- Applicable: High

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03118	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Cause	Electrical sources of ignition	Code	Status	Likelihood	Contribution
		RR-CA-00612	Active	Current Likely (4)	0.0%
				Proposed Likely (4)	0.0%

Comments Potential pathways include:
 - Failure of electrical components and / or electrical equipment
 - Transformer failure, arcing of outdoor equipment,
 - electrical systems overhead powerlines are also a cause of fire

This includes the Raw Coal Bunker and Crusher House.

Transformers on dredgers and stackers and other select high criticality locations on the coal face have silicon or other combustible (high flash point) oil to prevent fire.

Electrical Safety Management System & Electrical equipment maintenance and inspection to the relevant Australian Standard has been considered in the likelihood.

In the past 3 years (2012-2015), 3 of the 41 smouldering coal/fire events have been attributed to electrical ignition sources. The likelihood of this event is considered to be LIKELY.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02515	BC-00150	Electrical routine maintenance	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good
Base Control Comments	<p>This includes general maintenance on electrical systems that include switch rooms, cabinets, MCCs, motors and etc.</p> <p>Thermography is also conducted to identify potential hot spots within electrical systems.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Electrical routine maintenance									
Risk Control Comments	<p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (Considered in cause likelihood) - Applicable: High <p>Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02516	BC-00179	Electrical Safety Systems	No Owner Defined	In Service	100.0%	Critical Control	Engineering	1-Sep-2015	Good
Base Control Comments	<p>Electrical equipment is provided with earth leakage (residual current device) and overcurrent protection devices, as required by the governing legislation.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Engineering - Reliability: V. Good - Monitoring/Auditing: Performance monitoring (includes oversight of electrical systems which is undertaken by the responsible electrical regulator) <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Earth leakage (residual current devices) and overcurrent protection devices									
Risk Control Comments	<p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: High - Applicable: High <p>Based on the above, full applicability is assigned.</p>									

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02760	BC-00471	Detection and suppression on electrical equipment	No Owner Defined	In Service	100.0%	Critical Control	Engineering	8-Oct-2015	Average

Base Control Comments Switch rooms (post 2012) and some of the equipment (post 2012) will have automated detection and suppression. Other equipment items are reliant on activation of the manual fire suppression systems.

The base control is assessed via the following:
 - Implemented: Part (fully implemented in switch rooms post 2012)
 - Type: Administrative/Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be AVERAGE

Risk Control Context Detection and suppression on electrical equipment

Risk Control Comments The risk control is assessed via the following factors:
 - Independence: Mod-High
 - Applicable: High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03103	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:
 - Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Ember attack from bush fire or grass fire	RR-CA-00613	Active	Current Likely (4)	73.4%
			Proposed Likely (4)	73.4%

Active Risk Scenarios ID: RR-R-00073



Comments Bush fire and grass fire, whether internal or external to the Mine Lease Area (ML 5189), may present a hazard. The recent event at Hazelwood Mine (2014) showed that an external fire some kilometers away from the mine may present a threat which is real and should be managed as such.

- Ember attack or grass fire may originate from many sources, including:
- motor vehicle accident
 - lightning strike
 - farming equipment
 - uncontrolled burnt off - There is a potential for a planned burn off to become uncontrolled due to rapid changes in wind condition
 - natural gas pipeline leak.

Bush fire hazards are managed by other authorities. A severe ember attack from multiple fronts has the potential to exhaust the internal capabilities of AGL resources. Bush fires have occurred in Victoria, therefore the likelihood for a bush fire or ember attack that directly affect the mine is considered to be LIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02523	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Period specific plans put in place prior to high fire danger days

Risk Control Comments Site initiated weather monitoring during period of high fire danger.

Security and emergency services manager reviews the predictive weather conditions and determine appropriate response.

- Some of these activities include:
- Additional fire patrols (patrols are vital to early fire detection or identification of suspicious activity)
 - Vehicle patrols implemented by AGL around boundaries, early detection should result in activation of EMP
 - Mobile plant fire tankers are checked and are on stand by in these situations
 - Engaging additional emergency response personnel
 - Daily mine inspections by shift management personnel look at general risk conditions (additional housekeeping) to the mine, including external fire threats.
- Weather conditions may present an elevated fire threat. Inspection requirements cover the issue of fire
- Restricts high risk activities
 - Spraylines situated around the mine are activated to wet down exposed coal.

Memo to key operational staff alerting them of fire preparedness activities that need to be undertaken.

- The risk control is assessed via the following factors:
- Independence: Low (similar to personnel undertaking Mine Fire Preparedness and Prevention Procedure)
 - Applicable: High

Based on the above, no applicability is assigned, as period specific plans are undertaken by the same personnel who administer the Mine Preparedness and Prevention Procedure.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02527	BC-00199	External Buffers-Exclusion Zones	No Owner Defined	In Service	31.0%	Critical Control	Isolation	1-Sep-2015	Good

Base Control Comments Exclusion Zones 0110 code. The land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license.

The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. This include activities such as farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.

Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria. Exclusion zones around electrical infrastructure

The base control is assessed via the following:

- Implemented: Yes
- Type: Isolation
- Reliability: Good
- Monitoring/Auditing: None

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Buffer zone between coal mine and public access

Risk Control Comments The planning zone ultimately results in reduced population; reduced human activity in this zone and allows for vegetation to be controlled that may result in a reduced likelihood of fire.

The risk control is assessed via the following factors:

- Independence: Low (part of the Management of Vegetation to manage fuel loads)
- Applicable: High

Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02528	BC-00467	Environmental site plan - vegetation management	No Owner Defined	In Service	31.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments This plan manages the fire risks on the mine and surrounding areas, including reduced fuel loads (grazing/spraying/slashing), fire breaks and mineral earth breaks.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed as GOOD.

Risk Control Context Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine

Risk Control Comments The reduction of fuel load reduces the fire intensity and reduces the likelihood of additional embers from generated which could potentially affect the mine or exposed coal area. This control is not applicable to the exposed coal area.

Lessees and neighbouring land holders are requested to reduce fuel loads and inform AGL of suspicious activities/behaviours (this is part of the induction).

The risk control is assessed via the following factors:

- Independence: Low (part of the buffer zone between coal mine and public access control)
- Applicable: Moderate (only works for 75% of the mine area)

Based on the above, partial applicability is assigned.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-02762	BC-00468	Third party high danger period alerts	No Owner Defined	In Service	31.0%	Non-Critical Control	1-Sep-2015	Assessed

Base Control Comments CFA/DEP/MFB alert on high danger period. CFA issues alert to AGL staff on high fire danger period. CFA/DEP/MFB provide notification of both fires and advice during elevated fire danger period.

The base control is assessed via the following:
 - Implemented: Yes (Third party control)
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: None (Third party control)

As this is a third party control, the effectiveness is assessed to be ASSESSED.

Risk Control Context CFA/DEP/MFB alert on high danger period.

Risk Control Comments CFA issues an alert to AGL staff on high fire danger period. CFA/DEP/MFB provide notification of both fires and advice during elevated fire danger period.

The alerts trigger the activation of fire preparedness and prevention measures

The risk control is assessed via the following factors:
 - Independence: High
 - Applicable: Moderate

Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02763	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Mine Fire Preparedness and Prevention Procedure

Risk Control Comments The procedure in place to manage the risk during high fire danger periods.

The risk control is assessed via the following factors:
 - Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03104	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments
 The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
 Emergency Response Procedures - Fast Determined Response

Risk Control Comments
 Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:

- Independence: Low (part of the Mine Fire Preparedness and Prevention Procedure control)
- Applicable: Moderate

Based on the above, no applicability is assigned, as this is part of the Mine Fire Preparedness and Prevention Procedure control.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03105	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Clay capping

Risk Control Comments Capping of hot spot to prevent air/water ingress

Clay capping/grouting of identified hot spots and associated cracks can assist in preventing air ingress into an insitu hot spot. The reduction of air can ultimately reduce the ability of a coal hot spot to flash over to spontaneous combustion.

Application of suppressant should result in the fire behaving in a similar way to clay capping; where air supply to the hot spot is reduced (note that there is many suppressants on the market that may be utilised, a risk assessment is required prior to application).

This control is not applicable on the exposed coal area.

The risk control is assessed via the following factors:

- Independence: Low (part of the Buffer zone between coal mine and public access)
- Applicable: Moderate

Based on the above, no applicability is this is part of the Buffer zone between coal mine and public access control.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Cause	Bearing Friction Failure	Code	Status	Likelihood	Contribution
		RR-CA-00614	Active	Current Likely (4)	0.2%
				Proposed Likely (4)	0.2%

Comments Potential pathways include:
 - contacting parts (metal on metal)
 - wear and tear on bearings
 - Stand alone idler failure dropping hot material onto coal below, alternatively the belt is stopped and the idler sets fire to the belt and coal
 - build up of flammable material (grease, oil and coal)

This includes the Raw Coal Bunker and Crusher House.

In the past 3 years (2012-2015), 3 of the 41 smouldering coal/fire events have been attributed to bearing failure. The likelihood of this event is considered to be LIKELY.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02766	BC-00470	Detection and suppression on conveyor lines	No Owner Defined	In Service	100.0%	Critical Control	Engineering	8-Oct-2015	Average

Base Control Comments Some of the equipment will have automated detection and suppression on coal delivering structure. Other equipment items are reliant on activation of the manual fire suppression systems.

The Raw Coal Bunker and Crusher House fire detection and suppression system includes:

- Very Early Smoke Detection Alarm
- Thermal imaging cameras
- Manual deluge (operator initiated)

The base control is assessed via the following:

- Implemented: Part (fully implemented on the rising conveyors)
- Type: Administrative/Engineering
- Reliability: Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Detection and suppression on conveyor lines

Risk Control Comments Some of the equipment will have automated detection and suppression. Other equipment items are reliant on activation of the manual fire suppression systems.

The risk control is assessed via the following factors:

- Independence: Mod-High
- Applicable: High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02767	BC-00151	General Housekeeping	No Owner Defined	In Service	100.0%	Non-Critical Control	Administrative	1-Sep-2015	Assessed

Base Control Comments The housekeeping removes fuel (coal, grease, oil) around hot components, i.e. potential ignition sources.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be ASSESSED.

Risk Control Context Work area inspection will trigger the cleaning procedure

Risk Control Comments The procedure reduces the potential for fuel to come into contact with hot surfaces on the mobile plant thus reducing the potential for a fire.

General cleaning does not always extend to the required depth. It removes bulk coal material but often, layers of grease and oil may remain. Specialist cleaning utilising degreasing agents and pressurised steam may be required.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03190	BC-00469	Mechanical Maintenance Routine	No Owner Defined	In Service	0.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments Preventative maintenance program is designed to maintain equipment to minimise integrity related problems / and or unexpected failure.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Monitored and Audited

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Maintenance routine on bearings

Risk Control Comments The maintenance routine on bearings include a lubrication program (however most bearings are sealed and do not require manual lubrication) and condition monitoring. The results of condition monitoring and historical data determine when bearings are to be replaced

- The risk control is assessed via the following factors:
- Independence: Low (Considered in cause likelihood)
 - Applicable: High

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03197	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00073



Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03199	Probability of initial fire escalating	Active	Current Proposed	Unlikely (2) Unlikely (2) Rare (1) Rare (1)	0.1% 0.1%
Comments	The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.					

Cause	Hot Works	Code	Status	Likelihood	Contribution
		RR-CA-00615	Active	Current Proposed	0.7% 0.7%
Comments	Potential pathways includes welding / cutting. In the past 3 years (2012-2015), 2 of the 41 smouldering coal/fire events have been attributed to hot works. The likelihood of this event is considered to be LIKELY.				

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02541	BC-00088	HSP900 Permit to work system	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Very Good

Base Control Comments Systems and procedures are used to minimise the risk when conducting hot work. End of day shift collect all hot work permits and hand over to night shift where all fire watch requirements are captured. Night shift sign off on inspections as done during the evening

Control is rated as very good based on collective acknowledgement of the importance of this inspection ahead of other shift tasks.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Very Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be VERY GOOD.

Risk Control Context Hot work permit system

Risk Control Comments Depending on weather conditions, hot works may be suspended.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: Mod-High

- The risk control is assessed via the following factors:
- Independence: Low (Considered in cause likelihood)
 - Applicable: High

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03200	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03201	Probability of initial fire escalating	Active	Possible (3)	Rare (1)	0.1%
				Proposed	Rare (1)	0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Cause	Description	Code	Status	Likelihood	Contribution
	Light or heavy vehicle/mobile/ancillary equipment initiated fire	RR-CA-00616	Active	Likely (4)	0.7%
				Likely (4)	0.7%

Comments Wet coal build up on exhausts, then dries and catches fire on the exhaust - falling off onto the coal surface. Once a light/heavy vehicle is purchased, the exhaust system is tested to ensure the external temperature limits are within tolerable limits. Vehicles that do not meet this limits are rejected.

Mobile plant including dozers, rubber tyred dozers, Integrated Tool (IT) Carriers and haul trucks initiate fire on vehicle.

- Potential pathways include:
- build up of flammable material in critical areas
 - electrical failure
 - failed hydraulic hoses onto hot components
 - vehicle accidents

During the period when a mine fire alert has been declared, these vehicles are not permitted to be on the mine site.

Initiated fire events from stackers and dredgers have been considered in electrical, belts, bearings, brakes and conveyor causes

In the past 3 years (2012-2015), 5 of the 41 smouldering coal/fire events have been attributed to light or heavy vehicle/mobile/ancillary equipment. The likelihood of this event is considered to be LIKELY.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02771	BC-00315	Pre Startup Inspections	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	1-Sep-2015	Average
Base Control Comments	<p>This includes pre-startup checks to ensure that equipment is fit for purpose. The pre-startup process identifies if cleaning is required.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative/Behavioural - Reliability: Fair - Monitoring/Auditing: Ad-hoc <p>Based on the above, the effectiveness is assessed to be AVERAGE.</p>									
Risk Control Context	Pre Startup Inspections checklist triggers clean / washdown procedure									
Risk Control Comments	<p>Procedure reduces the potential for fuel to come into contact with hot surfaces on vehicles thus, reducing the potential of a fire.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (Considered in cause likelihood) - Applicable: High <p>Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03203	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good
Base Control Comments	<p>The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Response Procedures - Fast Determined Response									
Risk Control Comments	<p>Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided by both operations and site-based emergency staff.</p> <p>In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: High - Applicable: High <p>Based on the above, full applicability is assigned.</p>									

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03204	Probability of initial fire escalating	Active	Current	Rare (1)	0.1%
Comments	<p>The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.</p>					

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03252	BC-00433	Vehicle Standards Procedure	No Owner Defined	In Service	0.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Vehicle standard (incorporate aspects of CFA Act) sets out the requirements for all vehicles, which includes but not limited to:

- Comments**
- fire extinguisher
 - two way radio
 - fire hose and branch
 - detection/suppression on mobile plant

The base control is assessed via the following:

- Implemented: Yes
- Type: Engineering/Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Fire equipment standard for light or heavy vehicle/ancillary equipment

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Low (part of the Emergency Response Procedure - Fast Determined Response control)
- Applicable: Mod-High

Based on the above, no applicability is assigned as this control is part of the Emergency Response Procedure - Fast Determined Response control.

Cause	Code	Status	Likelihood	Contribution
Ignition through discarded cigarettes	RR-CA-00618	Active	Current Likely (4)	0.7%
			Proposed Likely (4)	0.7%

- Comments** Potential pathways include:
- smoking in unauthorised area
 - smoking below the grass level at the mine

In the past 3 years (2012-2015), 1 of the 41 smouldering coal/fire events have been attributed to ignition through discarded cigarettes. The likelihood of this event is considered to be LIKELY.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02550	BC-00310	HRP0024C Corporate Smoking Policy	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Average

Base Control Comments AGL Loy Yang Smoking Rules - applicable to all Loy Yang activities onsite.

Restricted smoking areas designated above grass level.
 No designated smoking areas in the mine below grass level or around coal carrying equipment. Smoking below grass level in the mine is cause for immediate dismissal in accordance with Corporate Smoking Policy HRP0024C AGL Loy Yang Smoking Rules.

AGL Golden Rules are in place as a set of clear rules on what can result as a breach of a safety rule, such as smoking in a restricted area. A breach of the Golden Rules by anyone at an AGL site may result in disciplinary action being taken, which may include termination of employment.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Behavioural
 - Reliability: Good
 - Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Restricted smoking areas

Risk Control Comments The risk control is assessed via the following factors:
 - Independence: Low (Considered in cause likelihood)
 - Applicable: High

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03206	Probability of initial fire escalating	Active	Current Possible (3) Proposed	Possible (3) Rare (1) Rare (1)	0.1% 0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03207	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments
The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
Emergency Response Procedures - Fast Determined Response

Risk Control Comments
Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Cause	Spontaneous combustion of coal	Code	Status	Likelihood	Contribution
		RR-CA-00619	Active	Current Likely (4)	0.0%
				Proposed Likely (4)	0.0%

Comments
Spontaneous combustion results from self-heating which is caused mainly by the oxidation of coal and other carbonaceous materials. If the heat generated by this reaction is trapped, such as in a stockpile, the temperature of the material will begin to rise and if unchecked may ultimately ignite; i.e. spontaneously combust.

The reactivity of the materials varies considerably; coal is a more reactive material than materials that contain no carbon, e.g. sandstone, rocks and soil and clay, are inert. In general, the reactivity of a material depends on its carbon content. Large amounts of reactive carbonaceous materials in stockpile increases the risk of spontaneous combustion.

Hot Spot:

- Deterioration of batter integrity
- Cavity formation
- Introduction of water to batter
- Undermining of batters and berms
- Localised generally single batter scale

Historically, there has been one known issue in 30 years, related to spontaneous combustion. This is isolated to one location on the Southern Batters. This is actively managed by Infrastructure Civil and Environment (ICE) group.

The likelihood of this event is considered to be LIKELY.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02553	BC-00166	Daily Mine Inspections	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	1-Sep-2015	Average	
Base Control Comments	Shift personnel are required to undertake work place inspection which includes looking for obvious ground related issues, i.e. ground movement and hotspots. The base control is assessed via the following: - Implemented: Part - Type: Administrative - Reliability: Fair - Monitoring/Auditing: Ad-hoc Based on the above, the effectiveness is assessed to be AVERAGE.										
Risk Control Context	Daily mine inspections by shift management personnel										
Risk Control Comments	A hot spot (or exothermic reaction in coal) in the mine is evidenced by steam or smoke emanating from a crack or stockpile. Daily mine inspections by shift management personnel look at general risk conditions within the mine, including hot spot events. Hot spot conditions may present similar to a fire event, as steam rising from cracks within in-situ coal etc. The risk control is assessed via the following factors: - Independence: Low (Considered in cause likelihood) - Applicable: Mod-High Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking
	RR-A-00046	Formalise the process of conducting daily mine inspections which includes looking for obvious ground related issues, i.e. ground movement and hotspots.					Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment	
	RR-COP-02554	BC-00216	CPW001M Ground Control Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	1-Sep-2015	Good	
Base Control Comments	GCMP - rainfall and pin monitoring. Regional subsidence model for prediction - LV Regional Groundwater Group. Stability analysis and batter design, ground movement modelling (predictions). The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Monitored and audited Based on the above, the effectiveness of the control is assessed to be GOOD.										
Risk Control Context	Fortnightly geotechnical engineering inspection and TARPS										
Risk Control Comments	Observing field conditions including steam arising from cracks/coal surfaces that may indicate spontaneous combustion conditions. Inspection may include temperature monitoring. Monitoring of cracks and recording via database. Suppression and sealing techniques under trial. Southern batters excavated and sealed. Exclusion of air will limit combustion but some heat build up may continue to occur. The risk control is assessed via the following factors: - Independence: High - Applicable: Mod-High Based on the above, full applicability is assigned.										
Actions	Code	Objective	Work to be Done				Priority	Implementer	Status	Complete By	Tracking

Active Risk Scenarios ID: RR-R-00073



RR-A-00005	Review subsidence and movement data and consider changing the density and frequency of pin line / movement surveys.	Normal	Pending	N/A
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Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02557	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Operating practice to excavate and remove and/or apply water on identified hot spot

Risk Control Comments The removal of an identified hot spot from additional fuel sources reduces the escalation of a fire. Also, includes application of water to the affected area may result in limiting the growth of the fire potential or suppression.

The risk control is assessed via the following factors:

- Independence: Mod (part of the clay capping/grouting of identified cracks control).
- Applicable: Mod-High

Based on the above, partial applicability is assigned as this control is part of the clay capping/grouting of identified cracks control.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02803	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments
The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
Clay capping/grouting of identified cracks

Risk Control Comments
Capping of hot spot to prevent air / water ingress

Clay capping/grouting of identified hot spots and associated cracks can assist in preventing air ingress into an in-situ hot spot. The reduction of air can ultimately reduce the ability of a coal hot spot to flash over to spontaneous combustion.

Application of suppressant should result in the fire behaving in a similar way to clay capping; where air supply to the hot spot is reduced (note that there is many suppressants on the market that could be utilised, a risk assessment is required prior to application).

The risk control is assessed via the following factors:

- Independence: Mod (part of the operating practice to excavate and remove and/or apply water on identified hot spot control)
- Applicable: Mod-High

Based on the above, partial applicability is assigned as this is part of the operating practice to excavate and remove and/or apply water on identified hot spot control.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03215	Probability of initial fire escalating	Active	Rare (1)	Rare (1)	0.1%
				Proposed	Rare (1)	0.1%

Comments
The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03253	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Cause	Description	Code	Status	Likelihood	Contribution
	Transmission tower and distribution lines operated by third party failure resulting in fire	RR-CA-00620	Active	Current Unlikely (2)	0.0%
				Proposed Unlikely (2)	0.0%

Comments Fire may result from damage to overhead line.

Potential pathways include:

- poles/wires/transformers failure
- switchgear failure

Historically, failure of these items have resulted in fires which have escalated to bush fires. However, within the Mine Lease and surrounding area, this has not been an issue of concern. Therefore, the likelihood is considered to be UNLIKELY.

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03216	Probability of initial fire escalating	Active	Current Rare (1)	Rare (1)	0.1%
				Proposed Rare (1)	Rare (1)	0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03217	BC-00467	Environmental site plan - vegetation management	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments This plan manages the fire risks on the mine and surrounding areas, including reduced fuel loads (grazing/spraying/slashing), fire breaks and mineral earth breaks.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed as GOOD.

Risk Control Context Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine

Risk Control Comments The reduction of fuel load reduces the fire intensity and reduces the likelihood of fire embers generated which could potentially affect the mine or exposed coal area. This control is not applicable to the exposed coal area.

The risk control is assessed via the following factors:

- Independence: Low
- Applicable: Moderate (only works for 75% of the mine area)

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03218	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03219		Implement oversight to ensure that SPI Ausnet manages their assets in accordance with legislation.	No Owner Defined	Proposed	100.0%	Non-Critical Control	16-Oct-2015	Assessed

Risk Control Context
Implement oversight to ensure that SPI Ausnet manages their assets in accordance with legislation.

Risk Control Comments
The implementation of this recommendation will provide ongoing assurance that third party contractors meet their obligation. Therefore, no risk reduction is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00055	Implement oversight to ensure that SPI Ausnet manages their assets (transmission tower and distribution lines) in accordance with legislation.		Normal		Pending		N/A

Cause	Code	Status	Likelihood	Contribution
Uncontrolled ignition sources from farming related activities (third party - local lessees)	RR-CA-00625	Active	Current Possible (3)	0.0%
			Proposed Possible (3)	0.0%

Comments
Potential pathways include:
- Failure of equipment
- burnoffs
- grass cutting

The likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02782	BC-00482	Third party contractual agreement (lessees)	No Owner Defined	In Service	100.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments
Lease agreement specifies that lessees must comply with the CFA Act. This includes:
- supply of fire suppression equipment
- maintenance of lessee equipment
- the observation of fire restrictions on total fire ban days
- fuel reduction requirements

AGL undertakes audits on lessees compliant with the above requirements.

The base control is assessed via the following:
- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
Third party contractual agreement (lessees)

Risk Control Comments
The risk control is assessed via the following factors:
- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03208	BC-00109	Site Security Fencing and Surveillance Systems	No Owner Defined	In Service	0.0%	Critical Control	Engineering	1-Sep-2015	Good

Base Control Comments Cameras are strategically installed along the site and monitored. On the observation of suspicious activities, AGL responds accordingly.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative/Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Cameras strategically installed along the site boundary and site perimeter includes security fencing

Risk Control Comments Cameras and response can identify approaching fire within the surrounding landscape.

Surveillance and double fenced perimeter in some areas assist in identifying approaching fire within the surrounding landscape.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Low (cameras and fencing are predominantly designed for surveillance related to provided controlled access)

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03209	BC-00474	Security Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Very Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Site security undertake regular patrols of the mining lease and surrounding areas.

Risk Control Comments Personnel undertaking patrols can detect a fire, however can fire could develop in between patrols.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low (infrequent to detect all fires).

Based on the above, no applicability is assigned.

Intermediate Event	Code	Description	Status	Current	Incoming	Outgoing	Probability
	RR-IE-03224	Probability of initial fire escalating	Active	Proposed	Rare (1)	Rare (1)	0.1%
					Rare (1)	Rare (1)	0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03227	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03254	BC-00467	Environmental site plan - vegetation management	No Owner Defined	In Service	31.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments This plan manages the fire risks on the mine and surrounding areas, including reduced fuel loads (grazing/spraying/slashing), fire breaks and mineral earth breaks.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed as GOOD.

Risk Control Context Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine

Risk Control Comments The reduction of fuel load reduces fire intensity and reduces the likelihood of additional embers from generated which could potentially affect the mine or exposed coal area. This control is not applicable on the exposed coal area.

Lessees and neighbouring land holders are requested to reduce fuel loads and inform AGL of suspicious activities/behaviours (this is part of the induction).

- The risk control is assessed via the following factors:
- Independence: Moderate
 - Applicable: Moderate (only works for 75% of the mine area)

Based on the above, partial applicability is assigned.



Cause	Code	Status	Likelihood	Contribution
Uncontrolled ignition source within the Mine Lease Area from members of the public	RR-CA-00626	Active	Current Possible (3)	0.0%
			Proposed Possible (3)	0.0%

Comments Potential pathways include:
 - cigarette butts
 - vehicle (inc. trucks) along Bartons Lane
 - members of the public accessing miner's lookout

The likelihood of this event is considered to be POSSIBLE.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03220	BC-00199	External Buffers-Exclusion Zones	No Owner Defined	In Service	31.0%	Critical Control	Isolation	1-Sep-2015	Good

Base Control Comments Exclusion Zones 0110 code. The land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license.

The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. This include activities such as farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.

Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria. Exclusion zones around electrical infrastructure

The base control is assessed via the following:

- Implemented: Yes
- Type: Isolation
- Reliability: Good
- Monitoring/Auditing: None

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Buffer zone between coal mine and public access

Risk Control Comments The planning zone ultimately results in reduced population; reduced human activity in this zone and allows for vegetation to be controlled that may result in a reduced likelihood of fire.

The risk control is assessed via the following factors:

- Independence: Low (part of the Management of Vegetation to manage fuel loads)
- Applicable: High

Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03221	BC-00467	Environmental site plan - vegetation management	No Owner Defined	In Service	31.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments This plan manages the fire risks on the mine and surrounding areas, including reduced fuel loads (grazing/spraying/slashing), fire breaks and mineral earth breaks.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed as GOOD.

Risk Control Context Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine

Risk Control Comments The reduction of fuel load reduces fire intensity and reduces the likelihood of additional embers generated which could potentially affect the mine or exposed coal area. This control is not applicable on the exposed coal area.

Lessees and neighbouring land holders are requested to reduce fuel loads and inform AGL of suspicious activities/behaviours (this is part of the induction).

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate (only works for 75% of the mine area)

Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03222	BC-00474	Security Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Very Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Site security undertake regular patrols of the mining lease and surrounding areas.

Risk Control Comments Personnel undertaking patrols can detect a fire, however can fire could develop in between patrols.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low (infrequent to detect all fires).

Based on the above, no applicability is assigned.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03225	BC-00109	Site Security Fencing and Surveillance Systems	No Owner Defined	In Service	0.0%	Critical Control	Engineering	1-Sep-2015	Good

Base Control Comments Cameras are strategically installed along the site and monitored. On the observation of suspicious activities, AGL responds accordingly.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative/Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Cameras strategically installed along the site boundary and site perimeter includes security fencing

Risk Control Comments Cameras and response can identify approaching fire within the surrounding landscape.

Surveillance and double fenced perimeter in some areas assist in identifying arson attack / approaching fire within the surrounding landscape.

- The risk control is assessed via the following factors:
- Independence: Low (not independent of the Site Security)
 - Applicable: Moderate

Based on the above, no applicability is assigned.

Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03226	Probability of initial fire escalating	Active	Current Proposed	Rare (1) Rare (1)	0.1% 0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03228	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
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RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.	Normal	Pending	N/A
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Cause		Code	Status		Likelihood	Contribution
Criminal intent to initiate an arson attack		RR-CA-00685	Active	Current	Likely (4)	23.7%
				Proposed	Likely (4)	23.7%

Comments There is sufficient propensity for an arson incident to occur within the La Trobe Valley. It is well known that there are approximately 200 person of interest that may choose to do harm to AGL Loy Yang. Therefore, the likelihood of this event is considered to be LIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03122	BC-00467	Environmental site plan - vegetation management	No Owner Defined	In Service	31.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments This plan manages the fire risks on the mine and surrounding areas, including reduced fuel loads (grazing/spraying/slashing), fire breaks and mineral earth breaks.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Monitored and audited

Based on the above, the effectiveness is assessed as GOOD.

Risk Control Context Management of vegetation to manage fuel load to reduce the intensity of the fire within the mine

Risk Control Comments The reduction of fuel load reduces the fire intensity and reduces the likelihood of additional embers from generated which could potentially affect the mine or exposed coal area. This control is not applicable to the exposed coal area.

Lessees and neighbouring land holders are requested to reduce fuel loads and inform AGL of suspicious activities/behaviours (this is part of the induction).

The risk control is assessed via the following factors:
 - Independence: Low (part of the buffer zone between coal mine and public access control)
 - Applicable: Moderate (only works for 75% of the mine area)

Based on the above, partial applicability is assigned.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03123	BC-00199	External Buffers-Exclusion Zones	No Owner Defined	In Service	31.0%	Critical Control	Isolation	1-Sep-2015	Good

Base Control Comments Exclusion Zones 0110 code. The land use is in line with local council zoning and town planning requirements. Buffer is defined from the mine crest and not the mining license.

The buffer allows AGL Loy Yang to manage (on land it owns) vegetation. This include activities such as farming, slashing, ploughing, summer crops, stock (fuel) management by grazing, earthen breaks.

Exclusion Zones in force. Bushfire mitigation plans in place and submitted to Energy Safe Victoria. Exclusion zones around electrical infrastructure

The base control is assessed via the following:

- Implemented: Yes
- Type: Isolation
- Reliability: Good
- Monitoring/Auditing: None

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Buffer zone between coal mine and public access

Risk Control Comments The planning zone ultimately results in reduced population; reduced human activity in this zone and allows for vegetation to be controlled that may result in a reduced likelihood of fire.

The risk control is assessed via the following factors:

- Independence: Low (part of the Management of Vegetation to manage fuel loads)
- Applicable: High

Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Reviewed	Assessment
	RR-COP-03124	BC-00468	Third party high danger period alerts	No Owner Defined	In Service	31.0%	Non-Critical Control	1-Sep-2015	Assessed

Base Control Comments CFA/DEP/MFB alert on high danger period. CFA issues alert to AGL staff on high fire danger period. CFA/DEP/MFB provide notification of both fires and advice during elevated fire danger period.

The base control is assessed via the following:

- Implemented: Yes (Third party control)
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: None (Third party control)

As this is a third party control, the effectiveness is assessed to be ASSESSED.

Risk Control Context CFA/DEP/MFB alert on high danger period.

Risk Control Comments CFA issues an alert to AGL staff on high fire danger period. CFA/DEP/MFB provide notification of both fires and advice during elevated fire danger period.

The alerts trigger the activation of fire preparedness and prevention measures

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Moderate

Based on the above, partial applicability is assigned.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03125	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	8-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Mine Fire Preparedness and Prevention Procedure

Risk Control Comments The procedure in place to manage the risk during high fire danger periods.

The risk control is assessed via the following factors:

- Independence: Low (part of the Escalation of Security Measures control).
- Applicable: High

Based on the above, no applicability is assigned as this control is part of the Escalation of Security Measures.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03126	BC-00474	Security Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Very Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Escalation of Security Measures

Risk Control Comments There is a defined escalation process/set of measures required to be undertaken by the site security personnel in the event that there is an elevated risk of criminal/terrorist attack.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03187	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments
The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
Period specific plans put in place prior to high fire danger days

Risk Control Comments
Site initiated weather monitoring during period of high fire danger.

Security and emergency services manager reviews the predictive weather conditions and determine appropriate response.

Some of these activities include:

- Additional fire patrols (patrols are vital to early fire detection or identification of suspicious activity)
- Vehicle patrols implemented by AGL around boundaries, early detection should result in activation of EMP
- Mobile plant fire tankers are checked and are on stand by in these situations
- Engaging additional emergency response personnel
- Daily mine inspections by shift management personnel look at general risk conditions (additional housekeeping) to the mine, including external fire threats. Weather conditions may present an elevated fire threat. Inspection requirements cover the issue of fire
- Restricts high risk activities
- Spraylines situated around the mine are activated to wet down exposed coal.

Memo to key operational staff alerting them of fire preparedness activities that need to be undertaken.

The risk control is assessed via the following factors:

- Independence: Low (similar to personnel undertaking Mine Fire Preparedness and Prevention Procedure)
- Applicable: High

Based on the above, no applicability is assigned, as period specific plans are undertaken by the same personnel who administer the Mine Preparedness and Prevention Procedure.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.		Normal		Pending		N/A

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03255	BC-00474	Security Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Very Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Site security undertake regular patrols of the mining lease and surrounding areas.

Risk Control Comments Personnel undertaking patrols can detect a fire, however can fire could develop in between patrols. However in the event of suspicious activities additional patrols will occur.

- The risk control is assessed via the following factors:
- Independence: Low (part of the escalation of security measures control)
 - Applicable: Moderate.

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03256	BC-00109	Site Security Fencing and Surveillance Systems	No Owner Defined	In Service	31.0%	Critical Control	Engineering	1-Sep-2015	Good

Base Control Comments Cameras are strategically installed along the site and monitored. On the observation of suspicious activities, AGL responds accordingly.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative/Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Cameras strategically installed along the site boundary and site perimeter includes security fencing

Risk Control Comments Cameras and response can identify approaching fire within the surrounding landscape.

Surveillance and double fenced perimeter in some areas assist in identifying arson attack / approaching fire within the surrounding landscape.

- The risk control is assessed via the following factors:
- Independence: High
 - Applicable: Moderate

Based on the above, partial applicability is assigned.

Cause	Code	Status	Likelihood	Contribution
Belts failure	RR-CA-00728	Active	Current	Likely (4) 0.2%
			Proposed	Likely (4) 0.2%



Comments Potential pathways include:

- Misalignment of belt, belt rubbing on structure
- Stand alone idler failure dropping hot material onto coal below, alternatively the belt is stopped and the idler sets fire to the belt and coal
- Build up of coal materials under belt and the material gets into bearing (including sealed bearings) can cause pre mature failure, bearing heat is sufficient to ignite surrounding material
- Build up of flammable material (grease, oil and coal)

This includes the Raw Coal Bunker and Crusher House.

In the past 3 years (2012-2015), 5 of the 41 smouldering coal/fire events have been attributed to belt friction. The likelihood of this event is considered to be LIKELY.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03192	BC-00469	Mechanical Maintenance Routine	No Owner Defined	In Service	0.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Preventative maintenance program is designed to maintain equipment to minimise integrity related problems / and or unexpected failure.

Comments

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Monitored and Audited

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Maintenance routine on conveyor belts

Context

Risk Control The maintenance routine on conveyor belts include:

Comments

- visual inspection whilst conveyor belt is running
- static visual inspection

The risk control is assessed via the following factors:

- Independence: Low (Considered in cause likelihood)
- Applicable: Mod-High

Based on the above, no applicability is assigned to this control as it has been included in the likelihood assessment.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03193	BC-00151	General Housekeeping	No Owner Defined	In Service	100.0%	Non-Critical Control	Administrative	1-Sep-2015	Assessed

Base Control Comments The housekeeping removes fuel (coal, grease, oil) around hot components, i.e. potential ignition sources.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness is assessed to be ASSESSED.

Risk Control Context Work area inspection will trigger the cleaning procedure

Risk Control Comments The procedure reduces the potential for fuel to come into contact with hot surfaces on the mobile plant thus reducing the potential for a fire.

General cleaning does not always extend to the required depth. It removes bulk coal material but often, layers of grease and oil may remain. Specialist cleaning utilising degreasing agents and pressurised steam may be required.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03194	BC-00142	Control Safety Devices	No Owner Defined	In Service	31.0%	Critical Control	Engineering	1-Sep-2015	Good

Base Control Comments The control safety devices are installed on all head-ends and tail-ends of conveyors. In the event of belt misalignment, conveyors are shut down on alarm.

Under-speed detectors are installed on all driven pulleys. The under-speed detection system alarms and trips.

The base control is assessed via the following:

- Implemented: Yes
- Type: Engineering/Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Belt alignment and underspeed detection switches

Risk Control Comments Should a component suffer a failure and cause either belt misalignment or under-speed, the belt will shut down.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Moderate (Not all failure modes can be prevented by this control).

Based on the above, partial applicability is assigned as this control does not prevent all failure modes.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03195	BC-00470	Detection and suppression on conveyor lines	No Owner Defined	In Service	31.0%	Critical Control	Engineering	8-Oct-2015	Average

Base Control Comments Some of the equipment will have automated detection and suppression on coal delivering structure. Other equipment items are reliant on activation of the manual fire suppression systems.

The Raw Coal Bunker and Crusher House fire detection and suppression system includes:

- Very Early Smoke Detection Alarm
- Thermal imaging cameras
- Manual deluge (operator initiated)

The base control is assessed via the following:

- Implemented: Part (fully implemented on the rising conveyors)
- Type: Administrative/Engineering
- Reliability: Good
- Monitoring/Auditing: Ad-hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Detection and suppression on conveyor lines

Risk Control Comments Some of the equipment will have automated detection and suppression. Other equipment items are reliant on activation of the manual fire suppression systems.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod (Some systems require manual activation by the operator).

Based on the above, partial applicability is assigned as some systems require manual activation by the operator.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03196	BC-00435	PCY000022 Fire Risk Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The Fire Risk Management Plan (draft) is an overarching document that brings all facets of fire risk for the mine together.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Response Procedures - Fast Determined Response

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure adequate level of response can be provided by both operations and site-based emergency staff.

In addition to operation staff, there are a minimum of 3 site-based emergency staff ready to mobilise. Additional personnel and firefighting equipment are on stand-by during high fire risk periods.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
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RR-A-00033	Update the Fire Risk Management Plan to incorporate activities undertaken by the site-based emergency services and operations team into a single and coordinated approach that is initiated as a result of an elevated fire danger.	Normal	Pending	N/A
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Intermediate Event	Code	Description	Status	Incoming	Outgoing	Probability
	RR-IE-03198	Probability of initial fire escalating	Active	Current Unlikely (2)	Rare (1)	0.1%
				Proposed Unlikely (2)	Rare (1)	0.1%

Comments The likelihood of this event and the initial emergency response activities (which includes mandatory CFA attendance) being unsuccessful and resulting in an escalation to a significant mine fire is considered to be UNLIKELY. Therefore, probability is assessed as 0.1%.

Consequences

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Fire risk with the potential to impact public safety	RR-CQ-00507	Public Safety	Current	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High
			Proposed	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02815	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Emergency Response Equipment
Context

Risk Control The emergency management plan specifies that the following equipment is available at the mine:

Comments

- 2 fire trucks (1 truck has Compressed Air Foam (CAF) capability)
- 2 roving security vehicles with CAFs capability
- 1 mine vehicle with CAF capability
- 1 ambulance,
- Fully fitted rescue vehicle
- Standard UHF radio system
- Fire retardant materials
- Fire extinguishers and hoses
- All mine compliant vehicles are equipped with fire extinguishers, hoses and branches
- CFA and SES equivalent equipment
- Earth moving equipment
- 3 water carts permanently situated onsite (2 x 30 kL, 1 x 10 kL)
- Heat camera used to search out hot spots on machines

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Emergency Management Plan and Fixed Mine Fire Detection and Suppression Equipment controls. Based on the above, partial applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02817	BC-00337	Fixed Mine Fire Detection and Suppression Equipment	No Owner Defined	In Service	31.0%	Critical Control	Engineering	8-Oct-2015	Good

Base Control Comments This activity involve the activation of spray lines and other suppression equipment as installed as fixed assets within the mine.

These assets are designed in accordance with Mine Fire Service design guidelines, which include key assets such as:

- the ability to cover 50% of the operational mine area with water
- capacity to supply 6400 L/sec to the mine spray line systems
- gravity supply of water from two locations namely fire service reservoir and High Level Storage Dam
- CFA compliant couplings every 50 m along operational spray lines
- strategically located truck fill points
- duplicated power supply to all mine key asset
- the fire main runs the length of the conveyor (either side) and has spray units located at intervals that allow complete coverage of the conveyor
- the main on the operating side of the conveyor is charged
- the main on the non-operating side is uncharged however all sprinkler points are open allowing activation of all sprinklers by charging the main
- dredgers are fitted with firewater tank (~2 KL) for initial response
- Hoses and extinguishers available at transfer points and at head ends
- Sprinkler, deluge and hose systems on dredgers/stackers fed from fire main

The base control is assessed via the following:

- Implemented: Yes
- Type: Engineering/Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Fixed Mine Fire Detection and Suppression Equipment

Risk Control Comments The risk control is assessed via the following factors:
 - Independence: Moderate
 - Applicable: Moderate

This has been assessed in combination with the Emergency Management Plan and Emergency Response Equipment controls. Based on the above, partial applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00050	Investigate the feasibility of installing long range infra-red system to monitor the open cut mining area (coal exposed areas).		Normal		Pending		N/A
	RR-A-00051	Determine the feasibility of installing an automated detection and suppression systems based on a multi-criteria assessment.		Normal		Pending		N/A



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02825	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good
Base Control Comments	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Management Plan									
Risk Control Comments	<p>Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided. Minimum emergency response team comprises of 3 people ready to mobilise. Additional personnel on stand-by during high fire risk periods. Evacuation sirens - regularly tested - weekly Tuesday 10:00am</p> <p>The ICC has a backup power supply. This includes site based emergency crew available 24 hour. Adopted guidelines for CFA protocol for managing exposure to carbon monoxide.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Moderate - Applicable: Moderate <p>This has been assessed in combination with the Fixed Mine Fire Detection and Suppression Equipment and Emergency Response Equipment controls. Based on the above, partial applicability is assigned.</p>									
Actions	Code	Objective	Work to be Done			Priority	Implementer	Status	Complete By	Tracking
	RR-A-00016	Conduct an assessment of the OH&S risk of responders' exposure to firewater (hygiene), smoke, carbon monoxide and voids from fire activities				Normal		Pending		N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03127	BC-00474	Security Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	14-Oct-2015	Good
Base Control Comments	<p>The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Very Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Incident (crime) management and escalation of security arrangements									
Risk Control Comments	<p>Assistance (provision of personnel, facilities and equipment) is provided to the authorities and additional security activities are stepped up depending on the level of threat.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (it does not address all causes - relates to arson only) - Applicable: Low (it does not address all causes - relates to arson only) <p>Based on the above, no applicability is assigned.</p>									

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03229		Vic police and CFA Response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed
Risk Control Context	Vic police and CFA Response									
Risk Control Comments	External emergency responders will initiate various plans and protocols in response to a major fire to minimise the risk to public health and property. The CFA will be required to treat the rehabilitated area no differently to the surrounding land uses.									
Although this is an effective and applicable control, the adequacy is not assessed as it is third party control.										

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03230	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	8-Oct-2015	Average
Base Control Comments	Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged.									
	The base control is assessed via the following: - Implemented: Yes - Type: Administrative - Reliability: Fair - Monitoring/Auditing: Ad-Hoc									
	Based on the above, the effectiveness of the control is assessed to be AVERAGE.									
Risk Control Context	Community Engagement Plan									
Risk Control Comments	Engagement of stakeholders within the community is the process to inform/manage community issues.									
	The risk control is assessed via the following factors: - Independence: Moderate - Applicable: Low									
Based on the above, no applicability is assigned.										

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Environmental risk from smoke with the potential to impact public amenities	RR-CQ-00508	Environment & Community	Current	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low
			Proposed	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03234	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Community Engagement Plan

Risk Control Comments Engagement of stakeholders within the community is the process to inform/manage community issues.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03235	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Emergency Response Equipment
Context

Risk Control The emergency management plan specifies that the following equipment is available at the mine:

Comments

- 2 fire trucks (1 truck has Compressed Air Foam (CAF) capability)
- 2 roving security vehicles with CAFs capability
- 1 mine vehicle with CAF capability
- 1 ambulance,
- Fully fitted rescue vehicle
- Standard UHF radio system
- Fire retardant materials
- Fire extinguishers and hoses
- All mine compliant vehicles are equipped with fire extinguishers, hoses and branches
- CFA and SES equivalent equipment
- Earth moving equipment
- 3 water carts permanently situated onsite (2 x 30 kL, 1 x 10 kL)
- Heat camera used to search out hot spots on machines

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Emergency Management Plan and Fixed Mine Fire Detection and Suppression Equipment controls. Based on the above, partial applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03236	BC-00337	Fixed Mine Fire Detection and Suppression Equipment	No Owner Defined	In Service	31.0%	Critical Control	Engineering	8-Oct-2015	Good

Base Control Comments This activity involve the activation of spray lines and other suppression equipment as installed as fixed assets within the mine.

- These assets are designed in accordance with Mine Fire Service design guidelines, which include key assets such as:
- the ability to cover 50% of the operational mine area with water
 - capacity to supply 6400 L/sec to the mine spray line systems
 - gravity supply of water from two locations namely fire service reservoir and High Level Storage Dam
 - CFA compliant couplings every 50 m along operational spray lines
 - strategically located truck fill points
 - duplicated power supply to all mine key asset
 - the fire main runs the length of the conveyor (either side) and has spray units located at intervals that allow complete coverage of the conveyor
 - the main on the operating side of the conveyor is charged
 - the main on the non-operating side is uncharged however all sprinkler points are open allowing activation of all sprinklers by charging the main
 - dredgers are fitted with firewater tank (~2 KL) for initial response
 - Hoses and extinguishers available at transfer points and at head ends
 - Sprinkler, deluge and hose systems on dredgers/stackers fed from fire main

The base control is assessed via the following:

- Implemented: Yes
- Type: Engineering/Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Fixed Mine Fire Detection and Suppression Equipment

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Emergency Management Plan and Emergency Response Equipment controls. Based on the above, partial applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
	RR-A-00050	Investigate the feasibility of installing long range infra-red system to monitor the open cut mining area (coal exposed areas).		Normal		Pending		N/A
	RR-A-00051	Determine the feasibility of installing an automated detection and suppression systems based on a multi-criteria assessment.		Normal		Pending		N/A



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03237	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Emergency Management Plan
Context

Risk Control Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and
Comments regular drills are undertaken to ensure an adequate level of response can be provided. Minimum emergency response team comprises of 3 people ready to mobilise. Additional personnel on stand-by during high fire risk periods. Evacuation sirens - regularly tested - weekly Tuesday 10:00am

The ICC has a backup power supply. This includes site based emergency crew available 24 hour. Adopted guidelines for CFA protocol for managing exposure to carbon monoxide.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Fixed Mine Fire Detection and Suppression Equipment and Emergency Response Equipment controls. Based on the above, partial applicability is assigned.

Consequence	Code	Category	Likelihood	Severity	Risk Rating
Smoke risk with the potential to impact the public safety	RR-CQ-00509	Public Safety	Current	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High
			Proposed	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02827	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Emergency Management Plan

Risk Control Comments Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided. Minimum emergency response team comprises of 3 people ready to mobilise. Additional personnel on stand-by during high fire risk periods. Evacuation sirens - regularly tested - weekly Tuesday 10:00am

The ICC has a backup power supply. This includes site based emergency crew available 24 hour. Adopted guidelines for CFA protocol for managing exposure to carbon monoxide.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Fixed Mine Fire Detection and Suppression Equipment and Emergency Response Equipment controls. Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-02830		Vic police, CFA, EPA and Department of Health Response	System Administrator	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed

Risk Control Context Vic police, CFA, EPA and Department of Health Response

Risk Control Comments External emergency responders will initiate various plans and protocols in response to hazards associated with smoke exposure to minimise the risk to public health.

Although this is an effective and applicable control, the adequacy is not assessed as it is third party control.

Active Risk Scenarios ID: RR-R-00073



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03233	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Community Engagement Plan

Risk Control Comments Engagement of stakeholders within the community is the process to inform/manage community issues.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03239	BC-00337	Fixed Mine Fire Detection and Suppression Equipment	No Owner Defined	In Service	31.0%	Critical Control	Engineering	8-Oct-2015	Good

Base Control Comments This activity involve the activation of spray lines and other suppression equipment as installed as fixed assets within the mine.

These assets are designed in accordance with Mine Fire Service design guidelines, which include key assets such as:

- the ability to cover 50% of the operational mine area with water
- capacity to supply 6400 L/sec to the mine spray line systems
- gravity supply of water from two locations namely fire service reservoir and High Level Storage Dam
- CFA compliant couplings every 50 m along operational spray lines
- strategically located truck fill points
- duplicated power supply to all mine key asset
- the fire main runs the length of the conveyor (either side) and has spray units located at intervals that allow complete coverage of the conveyor
- the main on the operating side of the conveyor is charged
- the main on the non-operating side is uncharged however all sprinkler points are open allowing activation of all sprinklers by charging the main
- dredgers are fitted with firewater tank (~2 KL) for initial response
- Hoses and extinguishers available at transfer points and at head ends
- Sprinkler, deluge and hose systems on dredgers/stackers fed from fire main

The base control is assessed via the following:

- Implemented: Yes
- Type: Engineering/Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Fixed Mine Fire Detection and Suppression Equipment

Risk Control Comments The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Emergency Management Plan and Emergency Response Equipment controls. Based on the above, partial applicability is assigned.

Actions	Code	Objective	Work to be Done	Priority	Implementer	Status	Complete By	Tracking
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RR-A-00050	Investigate the feasibility of installing long range infra-red system to monitor the open cut mining area (coal exposed areas).	Normal	Pending	N/A
RR-A-00051	Determine the feasibility of installing an automated detection and suppression systems based on a multi-criteria assessment.	Normal	Pending	N/A

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03240	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:

Comments

- Vic police
- EPA
- West Gippsland Catchment Management Authority
- Gippsland Water and
- Department of Health etc.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Emergency Response Equipment
Context

Risk Control The emergency management plan specifies that the following equipment is available at the mine:

Comments

- 2 fire trucks (1 truck has Compressed Air Foam (CAF) capability)
- 2 roving security vehicles with CAFs capability
- 1 mine vehicle with CAF capability
- 1 ambulance,
- Fully fitted rescue vehicle
- Standard UHF radio system
- Fire retardant materials
- Fire extinguishers and hoses
- All mine compliant vehicles are equipped with fire extinguishers, hoses and branches
- CFA and SES equivalent equipment
- Earth moving equipment
- 3 water carts permanently situated onsite (2 x 30 kL, 1 x 10 kL)
- Heat camera used to search out hot spots on machines

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Moderate

This has been assessed in combination with the Emergency Management Plan and Fixed Mine Fire Detection and Suppression Equipment controls. Based on the above, partial applicability is assigned.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03244	BC-00483	Loy Yang Mining Licence 5181 Work Plan	No Owner Defined	In Service	31.0%	Critical Control	Administrative	16-Oct-2015	Good

Base Control
Comments The work plan includes:
 - commitments to government on key components on the mine rehabilitation
 - the site will be rehabilitated to its next use, which is proposed to be pasture for grazing and the waterbody at the base of the mine
 - outlines progressive mine rehabilitation

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control
Context Rehabilitated land

Risk Control
Comments Rehabilitated land still presents a fire risk, as the grass and pasture can be consumed by fire. However, the duration and intensity of this fire is less than the mine, therefore, the subsequent smoke is expected to be smaller, in comparison to a coal fire.

The risk control is assessed via the following factors:
 - Independence: Moderate
 - Applicable: Mod-Low

Based on the above, partial applicability is assigned.



Risk Scenario Details

Status Active

Top Event **Gas pipelines fire/explosion**

Scenario **Loss of containment from LP and HP natural gas pipelines**

Comments The natural gas pipeline includes the high pressure transmission pipeline to Loy Yang B from the east and the low pressure distribution pipeline to AGL Loy Yang from the west.

These are assets owned and maintained by APA and licensed by the appropriate authority. Therefore this assessment only includes potential hazards that AGL Loy Yang pose on the pipeline. Controls managed by APA are excluded from this assessment.

Ratings Qualitative (Automatically Calculated)

Top Event	Likelihood	Consequence	Category	Consequence Severity	Max Consequence Risk
Current	Rare (1)		Public Safety	Level 5 (5)	High
Proposed	Rare (1)		Public Safety	Level 5 (5)	High

Causes

Cause	Description	Code	Status
	Damage to natural gas line to Loy Yang B due to ground movement	RR-CA-00622	Rejected
Comments	Mining related activities does not create longitudinal strain on the pipeline. Therefore, this is not considered to be a credible cause of a loss of containment.		

Cause	Description	Code	Status	Likelihood	Contribution
	Damage to natural gas line due to excavation or ground penetration	RR-CA-00623	Active	Current: Unlikely (2)	100.0%
				Proposed: Unlikely (2)	100.0%
Comments	There is a potential for a leak resulting in a fire and/or explosion within the mine lease area, which may impact Bartons Lane and Loy Yang B personnel. There was a recent incident where a pipeline was impacted by an excavator, however there was no loss of containment.				
	The likelihood of this event to result in a loss of containment is considered to be UNLIKELY.				

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-02876	BC-00088	HSP900 Permit to work system	No Owner Defined	In Service	100.0%	Critical Control	Administrative	1-Sep-2015	Very Good

Base Control Comments Systems and procedures are used to minimise the risk when conducting hot work. End of day shift collect all hot work permits and hand over to night shift where all fire watch requirements are captured. Night shift sign off on inspections as done during the evening

Control is rated as very good based on collective acknowledgement of the importance of this inspection ahead of other shift tasks.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Very Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be VERY GOOD.

Risk Control Context Permit to dig

Risk Control Comments Systems and procedures are used to minimise the risk to underground services when excavating. This includes ringing "dial before you dig".

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Mod-High

Based on the above, full applicability is assigned.

Consequences

Consequence	Description	Code	Category	Likelihood	Severity	Risk Rating
	Natural gas pipeline leak and associated fire/explosion with the potential to impact public safety					

Active Risk Scenarios ID: RR-R-00074



RR-CQ-00513

Public Safety

Current

Rare (1)

Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)

High

Proposed

Rare (1)

Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)

High

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03241	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	9-Oct-2015	Good

Base Control Comments
 The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:
 - Vic police
 - EPA
 - West Gippsland Catchment Management Authority
 - Gippsland Water and
 - Department of Health etc.

The base control is assessed via the following:
 - Implemented: Yes
 - Type: Administrative
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context
 Emergency Management Plan

Risk Control Comments
 Includes fire instructions that initiates the required emergency response to the incident which reduces the risk of the event escalating. Personnel are trained and regular drills are undertaken to ensure an adequate level of response can be provided. Minimum emergency response team comprises of 3 people ready to mobilise. Additional personnel on stand-by during high fire risk periods. Evacuation sirens - regularly tested - weekly Tuesday 10:00am

The ICC has a backup power supply. This includes site based emergency crew available 24 hour. Adopted guidelines for CFA protocol for managing exposure to carbon monoxide.

The risk control is assessed via the following factors:
 - Independence: High
 - Applicable: Mod-High

Based on the above, full applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03249		Vic police and CFA Response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed

Risk Control Context
 Vic police and CFA Response

Risk Control Comments
 External emergency responders will initiate various plans and protocols in response to major fire to minimise the risk to public health and property. The CFA will be required to treat the rehabilitated area no differently to surrounding land uses.

Although this is an effective and applicable control, the adequacy is not assessed as this is third party control.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03250	BC-00436	P000081 Community Engagement Plan	No Owner Defined	In Service	0.0%	Non-Critical Control	Administrative	8-Oct-2015	Average

Base Control Comments Community Engagement Plan will be activated as required to inform any community concern following a significant incident. Applicable stakeholders will be engaged.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Fair
- Monitoring/Auditing: Ad-Hoc

Based on the above, the effectiveness of the control is assessed to be AVERAGE.

Risk Control Context Community Engagement Plan

Risk Control Comments Engagement of stakeholders within the community is the process to inform/manage community issues.

The risk control is assessed via the following factors:

- Independence: Moderate
- Applicable: Low

Based on the above, no applicability is assigned to this.



Risk Scenario Details

Status Active

Top Event **Criminal act**

Scenario **Criminal act which may impact public safety and/or the environment**

Comments A gap assessment was undertaken to determine potential causes not previously identified and/or causes identified that had the potential to impact public safety and or the environment. Potential gaps as identified are included on this bowtie.

Ratings Qualitative (Automatically Calculated)

	Top Event	Likelihood	Consequence	Category	Consequence	Severity	Max Consequence Risk
Current	Rare (1)		Public Safety		Level 5 (5)		High
Proposed	Rare (1)		Public Safety		Level 5 (5)		High

Causes

Cause	Description	Code	Status
	Criminal intent to initiate an arson attack	RR-CA-00688	Rejected
Comments	This cause is addressed in RR-R00073. Therefore, this cause is not included on this bowtie.		

Cause	Description	Code	Status
	Criminal intent to damage the integrity of the High Level Storage Dam, Settling Pond, OB dam or Fire Services Pond Dam	RR-CA-00689	Rejected
Comments	<p>This causes includes a criminal act with intent to damage the integrity of various dams/ponds resulting in a dam wall failure.</p> <p>The High Level Storage Dam and Settling Pond are located outside of the mine lease area, therefore it is assessed to be outside the scope of the Mine Risk Assessment and Management Plan. Therefore, these have not been considered in this assessment.</p> <p>It is not considered credible that a person wishing to do harm would take action to compromise the integrity of the dam wall of the OB dam or the Fire Services pond, as this would not result in damage of concern to AGL. It is also considered that the dam is not an attractive target and there is no motivation or capability to breach a dam wall. Therefore, this cause is rejected.</p> <p>Ground movement causes that have the potential to damage the integrity of the OB Dam or Fire Services Pond have been addressed in RR-R00066.</p>		

Cause	Description	Code	Status
	Criminal intent to damage a single block batter or wall movement	RR-CA-00695	Rejected
Comments	It is not considered a credible event for a person whose intent is to take action to compromise the integrity of the mine relating to batters and walls is conceived possible, as this would not result in damage to AGL of concern. Therefore, this cause is rejected.		

Cause	Description	Code	Status	Likelihood	Contribution
	Criminal intent to cause harm to assets within the mine lease	RR-CA-00726	Active	Rare (1)	100.0%
Comments	<p>The hazards and the controls that relate to the prevention and mitigation of risks to public safety and the environment are referenced in the Security Management Plan. No other credible causes of security or terrorism threats have been identified.</p> <p>The controls represented on this bowtie describe the main controls regarding aspects that prevent/mitigate criminal acts being deter, detect, respond and recover. The likelihood of this event is considered to be RARE.</p>				
				Current	100.0%
				Proposed	100.0%

Active Risk Scenarios ID: RR-R-00075



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03136	BC-00109	Site Security Fencing and Surveillance Systems	No Owner Defined	In Service	31.0%	Critical Control	Engineering	1-Sep-2015	Good

Base Control Comments Cameras are strategically installed along the site and monitored. On the observation of suspicious activities, AGL responds accordingly.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative/Engineering
 - Reliability: Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness of the control is assessed to be GOOD.

Risk Control Context Cameras strategically installed along the site boundary and site perimeter includes security fencing

Risk Control Comments Cameras and response can identify an approaching fire within the surrounding landscape.

Surveillance and double fenced perimeter in some areas assist in identifying arson attack / approaching fire within the surrounding landscape.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: Moderate

Based on the above, partial applicability is assigned.

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03137	BC-00474	Security Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	1-Sep-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

- The base control is assessed via the following:
- Implemented: Yes
 - Type: Administrative
 - Reliability: Very Good
 - Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Site security undertake regular patrols of the mining lease and surrounding areas.

Risk Control Comments The patrols are vital to early fire detection or identification of suspicious activity.

The risk control is assessed via the following factors:

- Independence: Low (not independent of Escalation of Security Measures)
- Applicable: Mod-High

Based on the above, no applicability is assigned, as applicability has been assigned to the Escalation of Security Measures control.



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COP-03138	BC-00474	Security Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Very Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Escalation of Security Measures

Risk Control Comments There is a defined escalation process/set of measures required to be undertaken by the site security personnel in the event that there is an elevated risk of criminal/terrorist attack.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.

Cause	Description	Code	Status
	Contamination of Traralgon or Sheepwash Creek with chemical or toxin (malicious act).	RR-CA-00732	Rejected

Comments This cause is addressed in RR-R00063. Therefore, this cause is not included on this bowtie.

Consequences

Consequence	Description	Code	Category	Likelihood	Severity	Risk Rating
	Criminal related hazard with the potential to impact public safety	RR-CQ-00556	Public Safety	Current	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High
				Proposed	Rare (1) Serious harm to members of the public. Members of the public required to be displaced for a significant period of time (weeks)	High



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03132	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	9-Oct-2015	Good
Base Control Comments	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Response Plan									
Risk Control Comments	<p>The Emergency Management Plan details the required response to various criminal acts.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low (not independent of Security Response Procedure) - Applicable: Mod-High <p>Based on the above, no applicability is assigned as this is not independent of the Security Response Procedure.</p>									
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03133		Agency and government response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed
Risk Control Context	Agency and government response									
Risk Control Comments	<p>External emergency responders will initiate various plans and protocols in response to major fire and/or criminal act to minimise the risk to public health and property.</p> <p>Although this is an effective and applicable control, the adequacy is not assessed as this is third party control.</p>									
Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03135	BC-00474	Security Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good
Base Control Comments	<p>The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.</p> <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Very Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness is assessed to be GOOD.</p>									
Risk Control Context	Security Response Procedure									
Risk Control Comments	<p>In the event of a security threat, scenario plans as identified in the Security Management Plan Manual are initiated.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: High - Applicable: High <p>Based on the above, full applicability is assigned.</p>									



Consequence	Criminal related hazard with the potential to impact the environment		Code	Category	Likelihood	Severity	Risk Rating
			RR-CQ-00557	Environment & Community	Current	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low
					Proposed	Rare (1) Moderate, short to medium term environmental impact that may extend beyond AGL's operational area and/or may result in local community complaint(s).	Low

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03139	BC-00186	HSM0001C Emergency Management Plan	No Owner Defined	In Service	0.0%	Critical Control	Administrative	9-Oct-2015	Good
Base Control Comments	<p>The activation of the Emergency Management Plan may require engagement from major relevant stakeholders which may include:</p> <ul style="list-style-type: none"> - Vic police - EPA - West Gippsland Catchment Management Authority - Gippsland Water and - Department of Health etc. <p>The base control is assessed via the following:</p> <ul style="list-style-type: none"> - Implemented: Yes - Type: Administrative - Reliability: Good - Monitoring/Auditing: Performance monitoring <p>Based on the above, the effectiveness of the control is assessed to be GOOD.</p>									
Risk Control Context	Emergency Response Plan									
Risk Control Comments	<p>The Emergency Management Plan details the required response to various criminal acts.</p> <p>The risk control is assessed via the following factors:</p> <ul style="list-style-type: none"> - Independence: Low - Applicable: Mod-High <p>Based on the above, no applicability is assigned as this is not independent of the Security Response Procedure.</p>									

Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03140		Agency and government response	No Owner Defined	In Service	100.0%	Non-Critical Control		9-Oct-2015	Assessed
Risk Control Context	Agency and government response									
Risk Control Comments	<p>External emergency responders will initiate various plans and protocols in response to major fire and/or criminal act to minimise the risk to public health and property.</p> <p>Although this is an effective and applicable control, the adequacy is not assessed as this is third party control.</p>									



Risk Control	Code	Tag ID	Description	Owner	Status	Applicability Factor	Criticality	Type/Factor	Reviewed	Assessment
	RR-COM-03141	BC-00474	Security Management Plan	No Owner Defined	In Service	100.0%	Critical Control	Administrative	14-Oct-2015	Good

Base Control Comments The security and management plan cover aspects of deter, detect, respond and recover. It also includes a business resilience plan.

The base control is assessed via the following:

- Implemented: Yes
- Type: Administrative
- Reliability: Very Good
- Monitoring/Auditing: Performance monitoring

Based on the above, the effectiveness is assessed to be GOOD.

Risk Control Context Security Response Procedure

Risk Control Comments In the event of a security threat, scenario plans as identified in the Security Management Plan Manual are initiated.

The risk control is assessed via the following factors:

- Independence: High
- Applicable: High

Based on the above, full applicability is assigned.