HAZARDS AND SAFETY RISK ASSESSMENT

LAKE VERMONT MEADOWBROOK PROJECT

PREPARED FOR
BOWEN BASIN COAL PTY LTD

JULY 2022

aarc
ENVIRONMENTAL SOLUTIONS

BRISBANE OFFICE
164 Wharf Street
Spring Hill QLD 4000
P +61 7 3217 8772

E info@aarc.net.au
AARC.NET.AU

ABN. 71 620 818 920
ACN. 620 818 920

Document Control

Project Name:	Lake Vermont Meadowbrook Project
Report Title:	Hazards and Safety Risk Assessment
Client:	Bowen Basin Coal Pty Ltd
Project Manager:	Stuart Ritchie

Version	Comments	Author	Reviewer	Date
Draft issued for client review		PF	SR	14 July 2022
Final issued to client		PF	SR	15 July 2022

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 Background

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Bowen Basin Coal Pty Ltd (Bowen Basin Coal) to conduct a Hazards and Safety Risk Assessment for the Lake Vermont Meadowbrook Project (the Project) Environmental Impact Statement (EIS).

The Project is located approximately 160 km south-west of Mackay and approximately 25 km north-east of Dysart in the Bowen Basin region of central Queensland (Figure 1).

The Project represents an extension of mining activities at the existing Lake Vermont Mine and involves underground longwall mining and open cut mining activities and the development of supporting infrastructure. The existing Lake Vermont Mine operates within Mining Lease (ML) 70331, ML 70477 and ML 70528 (Figure 2) in accordance with Environmental Authority (EA) Permit No. EPML00659513. The proposed Project extension footprint lies within Mineral Development Licence (MDL) 303 and MDL 429 held by the proponent. Bowen Basin Coal intends to submit a future Mining Lease Application (MLA) over MDL 303 and MDL 429.
Key components of the Project include:

- underground longwall mining of the Leichhardt Lower Seam and Vermont Lower Seam; the depth and thickness of the coal seams in the Project area means the coal resource can be extracted using underground mining methods;
- an open cut satellite pit to mine the Leichhardt Lower Seam, Vermont Seam and Vermont Lower Seam;
- development of a new infrastructure corridor linking the new mining area to the existing infrastructure of the Lake Vermont Mine;
- development of a mine infrastructure area (MIA);
- construction of drifts and a portal to provide access to underground operations; and
- development of other supporting infrastructure and associated activities.

The conceptual layout of the Project is shown in Figure 3.

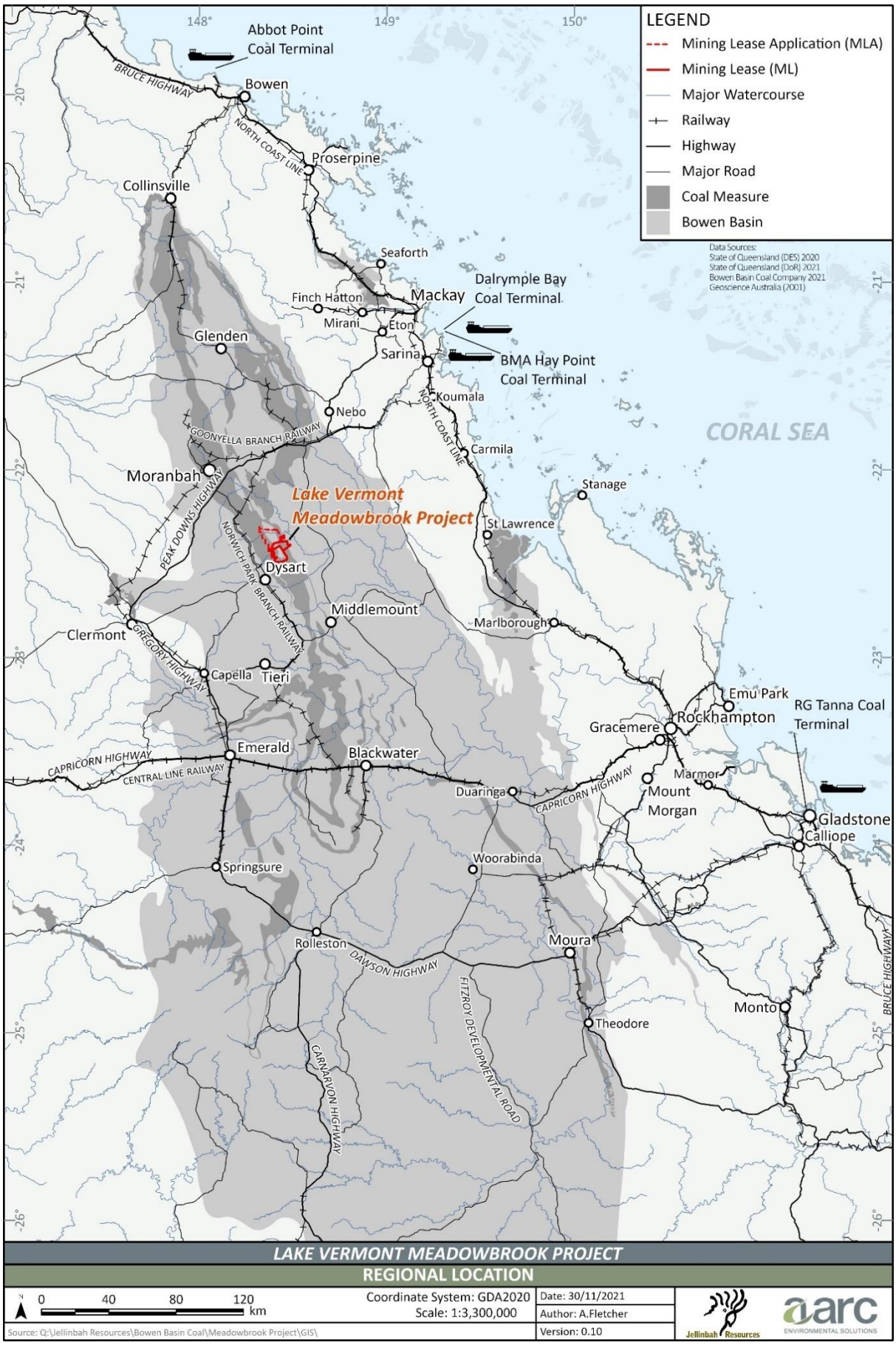

Figure 1: Regional location

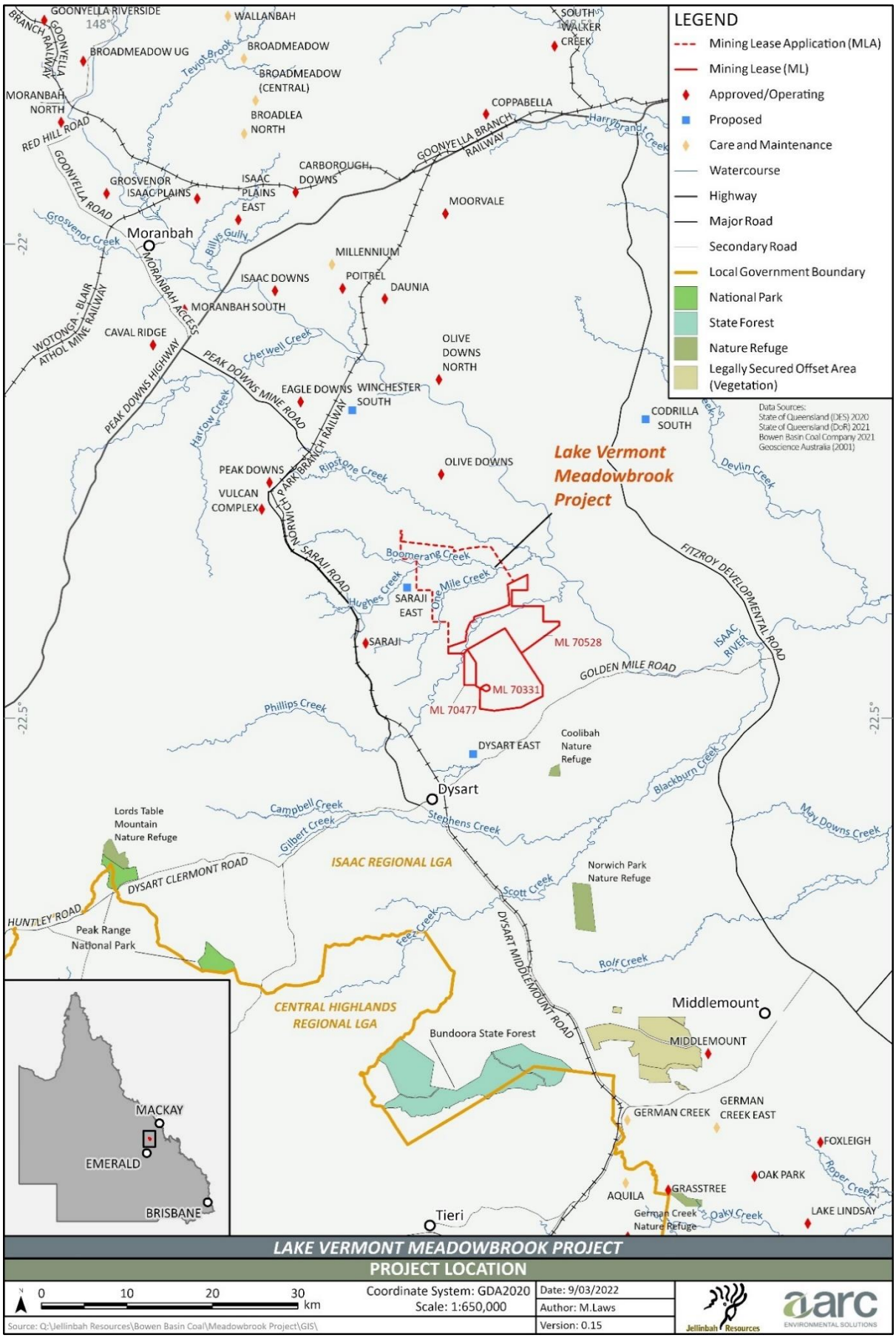

Figure 2: Project location

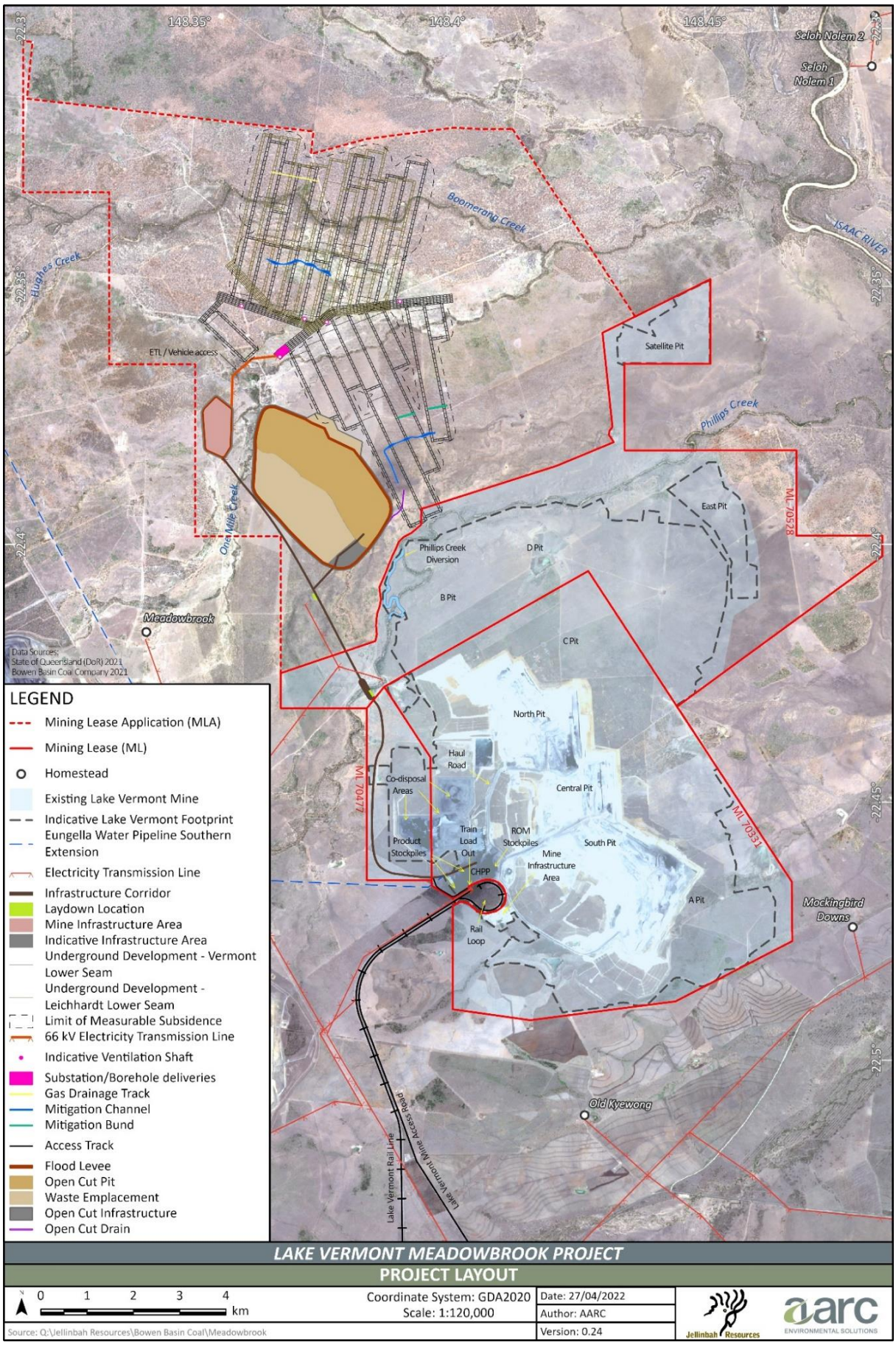

Figure 3: Conceptual Project layout

2 Risk assessment methodology

This section describes the potential hazards and risks to people, property, environmental values and the community that may result from the Project's construction, operation and decommissioning rehabilitation phases. A risk assessment has been prepared to identify the potential risks and considered stakeholders, Project processes and assets, environmental and external factors, relevant legislation, standards and guidelines and the following references:

- 'AS/NZS ISO 31000:2018 Risk Management–Guidelines' (Standards Australia 2018);
- 'HB203:2012 Managing environment-related risk' (Standards Australia 2012);
- 'Recognised Standard 02 Control of risk management practices *Coal Mining Safety and Health Act 1999'* (CMSH Act); and
- The Queensland Emergency Risk Management Framework (Queensland Government 2020).

Any risk assessment needs to be undertaken in consideration of the scope, context and criteria relevant to the assessment. For this risk assessment, the following scope and purpose have been agreed to:

> *The purpose of this risk assessment is to identify and analyse any risks arising as a result of the Project that may impact on environmental aspects, including socio-economic aspects, at the local, regional and state levels and across the construction, operational and closure stages of the Project.*

The following assumptions have also been identified:

- Occupational health and safety hazards are assumed to be assessed and managed at an operational level in accordance with strict legislated requirements, recognised standards made under the CMSH Act and contemporary mining industry practice.
- The risk assessment is a preliminary and high-level assessment set at the overall Project level. Therefore, while some risk scenarios may be considered generic, the assessment workshop process interrogates the risk scenarios to focus on Project and site-specific aspects in assessing hazards and risks.
- Risks have been assessed on the basis that the existing, contemporary operational controls will apply to the Project.

In accordance with the process outlined in 'AS ISO 31000:2018 Risk Management–Guidelines' (Standards Australia 2018), risks have been identified to take into account sensitive receptors and the broad set of potential hazards and risks associated with the Project.

Potential hazards that could pose risks to people, property and the environment from non-routine or abnormal scenarios have been identified by considering:

- historical industry experience;
- Project context;
- hazardous substances;
- natural hazards;
- regulatory triggers; and
- external factors.

3 Risk assessment scheme

The most likely and highest impact consequences posed by identified hazards have been assessed according to consequence and likelihood criteria matrices shown in Table 1 and Table 2. The maximum reasonable consequence from the occurrence of each hazard event has been determined assuming the effective application of standard and expected controls. The likelihood categories have been applied based on either a frequency or probability scale.

A risk severity ranking was determined from the risk analysis matrix, as shown in Table 3. The risk severity rankings have been reviewed against Table 4 to determine the requirement for additional controls that might be considered necessary depending on the final risk ranking.

More detailed qualitative descriptors to assist in classifying the consequence(s) specific to the identified impact type are shown in Table 5.

Results of the risk assessment, along with additional detail on the evaluation processes, are provided in Section 4.

Table 1: Consequence of impacts

Consequence rating	Impact on health and safety	Impact on infrastructure or property	Impact on natural environment	Impact on community
1 (Insignificant)	Minor injury with temporary impact on individual health	Damage that can be easily rectified	Negligible/minor effects on biological or physical environment	• Minor medium-term social impacts on local population—mostly repairable
2 (Minor)	Significant reportable injury with major impact	Superficial damage to infrastructure	Moderate, short-term effects but not affecting ecosystem functions	• Ongoing social issues • Permanent damage to items of cultural significance
3 (Moderate)	Major injury with severe impacts on one or more people	Moderate damage to infrastructure	Serious medium-term environmental effects	• Ongoing serious social issues • Significant damage to structures/items of cultural significance
4 (Major)	Single fatality or severe permanent impairment	Major damage to infrastructure	Very serious, long-term environmental impairment of ecosystem functions	• Ongoing severe social issues • Severe damage to structures/items of cultural significance
5 (Severe)	Multiple fatalities or permanent impacts on the health of a large number of people	Infrastructure severely affected	Extremely serious, long-term, potentially irreversible, environmental impairment of ecosystem functions	• Irreparable damage to community

Table 2: Likelihood criteria

Score	A (Almost certain)	B (Likely)	C (Possible)	D (Unlikely)	E (Rare)
Description	The event will occur often.	The event could easily happen.	The event could happen and has happened elsewhere.	The event has not happened but could.	Conceivable but only in extreme circumstances.
Frequency	Occurs more than once every year.	Occurs about once every year.	Occurs at least once every three years.	Occurs at least once every 10 years.	Occurs less than once every 30 years.
Probability	>95%	60–95%	30–60%	5–30%	<5%

Table 3: Risk analysis matrix

	Consequence				
Likelihood	**1 (Insignificant)**	**2 (Minor)**	**3 (Moderate)**	**4 (Major)**	**5 (Severe)**
A (Almost certain)	Medium (II)	Medium (II)	High (III)	Extreme (IV)	Extreme (IV)
B (Likely)	Medium (II)	Medium (II)	High (III)	High (III)	Extreme (IV)
C (Possible)	Low (I)	Medium (II)	Medium (II)	High (III)	High (III)
D (Unlikely)	Low (I)	Low (I)	Medium (II)	Medium (II)	High (III)
E (Rare)	Low (I)	Low (I)	Low (I)	Medium (II)	High (III)

Table 4: Risk level actions

Risk ranking	Risk level actions
Very high risk	Board and/or board-level committee attention required; action plans and management responsibility specified
High risk	Senior executive management attention required; action plans and management responsibility specified
Medium risk	Manage by specific monitoring or response procedures, with management responsibility specified
Low risk	Manage by routine procedures—unlikely to need specific application of resources

Table 5: Consequence classification

Consequence type	Consequences				
	Very low	**Low**	**Moderate**	**High**	**Very high**
Greenhouse	<0.6%	0.6–2.5%	2.5–7.5%	7.5%–15%	>15%
Health	• Reversible health effects of little concern • First aid treatment	• Reversible health effects of concern • Medical treatment	• Severe reversible health effects of concern • Lost time illness	Single fatality or irreversible health effects or disabling illness	Multiple fatalities or serious disabling illness to multiple people
Safety	• Low-level, short-term subjective inconvenience or symptoms • First aid treatment	• Reversible injury requiring treatment but does not lead to restricted duties • Medical treatment	• Reversible injury or moderate irreversible damage or impairment to one or more persons • Lost time injury	Single fatality and/or severe irreversible damage or severe impairment to one or more persons	Multiple fatalities or permanent damage to multiple people
On-site Environment	Near-source confined and promptly reversible impact (typically, a shift)	Near-source confined and short-term reversible impact (typically, one week)	Near-source confined and medium-term recovery impact (typically, one month)	Impact that is unconfined and requiring long-term recovery, leaving residual damage (typically, years)	Impact that is widespread, unconfined and requiring long-term recovery, leaving major residual damage (typically, years)
Off-site Environment	Not applicable	Near-source confined and promptly reversible impact (typically, a shift)	Near-source confined and short-term reversible impact (typically, one week)	Near-source confined and medium-term recovery impact (typically, one month)	Impact that is unconfined and requiring long-term recovery, leaving residual damage (typically, years)
Community trust	Tangible expressions of trust/mistrust among a handful of community members, with no influence on public opinion or decision-makers	Tangible expressions of trust/mistrust among a few community members, with some influence on public opinion and decision-makers	Tangible expressions of trust/ mistrust among some community members, with moderate influence on public opinion and decision-makers	Tangible expressions of trust/ mistrust among most community members, with significant influence on decision-makers	Widespread loss/gain of trust across the community setting the agenda for decision-makers and key stakeholders

Consequence type	Consequences				
	Very low	**Low**	**Moderate**	**High**	**Very high**
Compliance	• Non-conformance with internal requirements and very low potential for impact • Non-compliance with community commitment and goes unnoticed by external party/parties • Minimal effort to correct	• Non-compliance with external or internal requirements and low potential for impact • Formal censure • Non-compliance with community commitment • Limited effort to correct	• Non-compliance with internal or external requirements and moderate impact • Moderate penalties for breach of legislation, contract, permit or licence • Non-compliance with community commitment requiring reporting formally • Significant effort to correct	• Breach of licence(s), legislation, regulation—high potential for prosecution • Contract breach—significant penalty • Systemic internal standards breach—high impact • Community commitment breach—high potential business impact • Significant effort to fix	• Suspended or severely reduced operations imposed by regulators • Breach of community commitment resulting in direct loss of established consents with widespread secondary effects
Stakeholders	Key civil/political stakeholder(s) express support/dissatisfaction informally	Key civil/ political stakeholder(s) express support/dissatisfaction formally	Key civil/political stakeholder(s) threaten to oppose or disengage/ strengthen offers to support or engage	Key civil/political stakeholder(s) actively oppose or actively refuse to engage/actively support and engage	Key civil/political stakeholder(s) actively get others to oppose/engage
Cultural Heritage	Reparable damage to site or item of low cultural significance	Irreparable damage to site or item of low cultural significance	Repairable damage to site or item of cultural significance	Irreparable damage to site or item of cultural significance	Irreparable damage to site or item of international cultural significance

4 Risk analysis, evaluation and controls

The risk analysis workshop undertaken to analyse and evaluate potential risks and hazards of the Project used the following process steps:

- The basis and purpose of the risk identification was discussed and agreed on, as well as the process used to develop the risk scenarios, causes and impacts proposed in the risk assessment template.
- The risk assessment scheme, including the consequence descriptors for each consequence type, the likelihood classifications and the control effectiveness rankings, were evaluated and agreed upon.
- Each of the identified risk scenarios or descriptions was then considered in turn. In most cases, one or more of the 'risk/hazard title', 'causes' and 'impacts' proposed were refined as a result of the discussion.
- The risk controls expected to be in place were nominated and a 'control effectiveness' ranking was agreed upon for each control.
- The likelihood of each risk/hazard (subject to the expected control level) was considered, and a ranking was provided in accordance with the consensus view of the panel.
- The consequence category for the relevant impact or impacts was similarly assessed and ranked.
- The risk class was determined based on the risk matrix in use.
- For risks and hazards determined as being Classes III and IV, additional control measures were identified and assessed and, when effective and appropriate, proposed.

Unacceptably high risks were then subjected to further assessment to identify control measures likely to be effective in reducing risk levels. The generally accepted hierarchy of control was applied to minimise risks and was adopted in the following preferential order:

1) Eliminate the hazard or threat.
2) Minimise or replace the hazard or threat.
3) Control the risk using engineered devices that do not require human actuation.
4) Control the risk using devices that require human actuation.
5) Control the risk using appropriate procedures.
6) Control the risk using personal protective equipment (PPE).
7) Control the risk through administrative means (such as job rotation to limit exposures).
8) Control the risk with warnings and by raising awareness.

5 Results

The hazards associated with the Project, their causes, consequences and final risk ranking are presented in Table 6. Of the 60 unique risks identified and assessed, no class IV risks were identified while six Class III risks were identified. The identified Class III risks are summarised in Table 7, along with additional control measures able to be utilised to further minimise these risks. It should be noted that a number of Class II risk are so ranked by virtue of a potential fatality to an employee or as a consequence of necessary disturbance to be authorised by the EA if approval is granted.

5.1 Mitigation and management measures

5.1.1 Safety and health management systems (SMHS)

It is recommended that an SHMS be developed in accordance with the requirements of the CMSH Act. The SHMS should be based on AS/NZS 4801 'Occupational Health and Safety Management Systems' (Standards Australia/Standards New Zealand Committee 2001) and incorporate risk management elements and practices with clearly defined and measurable objectives.

The SHMS should document the standards, methods and procedures necessary to mitigate risks relevant to the stages of the Project and ensure legislative compliance. Strict adherence to the SHMS will be required by all personnel who enter the site (i.e. Project workforce, contractors and visitors).

Further, a detailed hazard and opportunities assessment should be undertaken as part of the final planning process for the various components of the development and construction phases of the Project. The assessment should build on the above preliminary hazard and risk assessment and identify the principal hazards for management focus during each phase of the Project.

The objectives of the SHMS should include (but not be limited to):

- compliance with regulatory requirements;
- leadership accountability at all levels;
- commitment to effectively communicate expectations and requirements;
- commitment to provide adequate resources, support and training;
- initiatives to actively involve and consult employees, contractors and other stakeholders;
- commitment to keep personnel informed and provide open communication;
- commitment to investigate all incidents and take necessary corrective actions to prevent recurrence;
- occupational rehabilitation programs;
- commitment to monitor, measure, review and audit SHMS adequacy and compliance with objectives;
- initiatives to implement changes to the SHMS based on monitoring and review outcomes; and
- commitment to foster continuous improvement.

Table 6: Risk assessment outcomes

Risk Description				Risk Evaluation										
Risk or Hazard Title	Causes (Triggers &/or Indicators)	Potential Impacts (Consequences)	Inherent Risk with Assumed Expected or Standard Controls	Likelihood / Probability	Greenhouse	Health	Safety	Environment On-site	Environment Off-site	Community Trust	Compliance	Reputation	Cultural Heritage	Risk Management Class
Amenity														
Amenity of local/regional/State residents														
Increased risk of motor vehicle incidents	Increased light and heavy vehicle movements associated with the Project	Ranges from inconvenience to fatality	Road access design (subject to regulatory controls) and public road controls	R			H							III
Increased rail movements	Increase in production	Annoyance, amenity	Lake Vermont TLO facility will hold required approvals	P						L				II
Increased heavy vehicle movements	Operational phase only	Other impacts limited largely to amenity (noise, dust) - vehicle interaction hazard addressed above.	Road access design (subject to regulatory controls) and public road controls. Road approved for required capacity.	P						L				II
Increased activism associated with coal mining impacts on environmental values	Existence of operation	Inconvenience, worker safety	Media monitoring, community/ stakeholder engagement program	P		L				L				II
External Environment														
Severe storms/ cyclone														
Cyclone	Natural hazards	Cyclone damage to project and surrounding properties - critical structures unprepared for event, contaminant release	Maintain structures to Australian Standard for zoning, emergency procedures and staff training, engineered bunding for containment	R		M	M		M					II
Earthquake	Natural hazards	Earthquake damage to project and surrounding properties - critical structures unprepared for event, contaminant release	Maintain structures to Australian Standard for zoning, emergency procedures and staff training, engineered bunding for containment	R		L	M		L					II
Heatwave	Natural hazards	Coal Mine Worker injury	Staff awareness training, hydration testing, hydrolytes available, fatigue management plans with regular breaks	U		M	M							II
Bushfire														
Impacts to surrounding properties	Project-related activities	Destruction to surrounding properties, operational cost	Distance from source, firebreaks, ERT with fire-fighting capacity	R						M				II
Flood														
Detrimental flooding impacts	Project location and extents (floodplain extents defined by levee location)	Flood depth afflux, inundation < 0.1% AEP range	Figure 3.45 in Chapter 3, indicates increase to the extent of inundation up to 0.25m to >4.5m for post closure flood model in relation to open cut infrastructure	R					L					II
Detrimental flooding impacts to neighbouring residents	Project location and extents (floodplain extents defined by levee location)	Flood depth afflux, velocity, inundation 1% to 10% AEP range	Figure 3.45 in Chapter 3, indicates increase to the extent of inundation up to 0.25m to >4.5m for post closure flood model in relation to open cut infrastructure	P					L					II
Flooding impacts on HES wetland	Project location and extents (floodplain extents defined by levee location)	Changed hydrology behaviour impact HES wetland ecology	No HES Wetland in Lake Vermont Meadowbrook MLA area	R					L					I
Flooding impacts to mine / final void	Project location and extents (floodplain extents defined by levee location)	Pit/ final void flooding, loss of access, property damage	Levee and final landforms designed to provide flood protection to 0.1% AEP and PMF event	R				L						I

Risk Description				Risk Evaluation										
Risk or Hazard Title	Causes (Triggers &/or Indicators)	Potential Impacts (Consequences)	Inherent Risk with Assumed Expected or Standard Controls	Likelihood / Probability	Greenhouse	Health	Safety	Environment On-site	Environment Off-site	Community Trust	Compliance	Reputation	Cultural Heritage	Risk Management Class
Hazards														
OHS														
Operational OHS Hazards	Construction, mining and industrial activities	Health, safety, operational cost	Staff awareness and training, safety management system	R		M	VH							III
ROM coal storage	Stockpiling spontaneously combustible material	Spontaneous combustion	Staff awareness and training for safe practices in procedures	P		L	L	VL	VL	VL				II
Hazardous chemicals														
Storage and use of hydrocarbon fuels	Storage system failure	Fire, spill/leak	Bunding maintained to Australian Standard	P		L	L	L	VL					II
Storage and use of explosives	Incorrect storage, accidental incident	Noise/vibration, fly rock, unplanned explosion	Appropriate storage and handling of explosives, staff training	R		M	VH	VL	VL	VL				III
Impacts on emergency services	Significant incident involving major hazardous facility	Health, safety, operational cost	Emergency Response Plan, staff awareness and training	U						VL				I
Physical Environment														
Noise														
Noise impacts to sensitive receptors (residents)	Noise emissions from plant, equipment and processes, road haulage	Annoyance, amenity, harm to wildlife	Distance from source, positioning of equipment for evening shift, attenuation packages for equipment, construction of noise bunds	P						L	L			II
Airblast overpressure and/or vibration impacts to local land use infrastructure	Blast events	Personnel/stock health and/or safety; infrastructure damage/loss	Contemporary blast design, airblast overpressure and vibration monitoring	U				M	L					II
Land and land use suitability														
Geotechnical failure of constructed structures and/or landforms	Blasting, wet weather, or a combination of both	Personnel/stock health and/or safety; loss of land	Engineered design for regulated structures (levee); geotechnical advice for landforms, low-walls and high-walls	R				M						II
Direct clearing, topsoil removal and earthworks	Soil characteristics, weather, unexpected flora/fauna impact	Erosion, damage to environmental values, dust	ESC practices followed, spotter catchers employed where necessary	AC				L	L					III
Impacts to the environment (downstream watercourses) from erosion of rehabilitated areas	Som dispersive soil characteristics, rehabilitated landform (slope, surface preparation, revegetation success, climate)	Downstream water quality, operational cost, compliance	Rehabilitation practices, ESC practices	U					M		L			II
Impacts to the environment (surface water and groundwater)	Waste rock inherent geochemical issues	Downstream water quality, flora, fauna, aquatic fauna, operational cost, compliance	Waste rock characterisations, short residence time on stockpiles, mining schedule	U					M					II
Impacts to the environment (land contamination)	Presence of contaminants	Localised land contamination	Appropriate storage of hazardous chemicals and fuels, training	R				L						I
Impacts to the environment and workforce health	Presence of carbonaceous materials (spontaneous combustion)	Air quality, safety	Appropriate storage and handling of carbonaceous materials, staff training	R			L		L					I
Air quality														
Dust impacts to sensitive receptors	Equipment, processes and vehicle movements on unsealed roads, and increased bare areas (waste rock dumps, TSF)	Annoyance, amenity (sensitive receptors), harm to wildlife, crop impact, contamination of water tanks	Distance from source, routine haul road watering, progressive rehabilitation, speed limits	P					L	M				III
Impacts to air quality (bushfire) - see also assessment under 'External Environment'	Project-related activities	Health, safety, amenity, harm to wildlife, annoyance	Onsite containment and control measures, staff training	R						M				II
Visual amenity														
Visual impact to sensitive receptors	Changed landforms, viewscape obstruction, prominent plant and equipment and night-time light spillage	Annoyance, amenity	Progressive rehabilitation of waste rock dumps, and lighting to Australian Standard.	U					VL	VL				I

Risk Description				Risk Evaluation										
Risk or Hazard Title	Causes (Triggers &/or Indicators)	Potential Impacts (Consequences)	Inherent Risk with Assumed Expected or Standard Controls	Likelihood / Probability	Greenhouse	Health	Safety	Environment On-site	Environment Off-site	Community Trust	Compliance	Reputation	Cultural Heritage	Risk Management Class
Land														
Airblast overpressure and/or vibration impacts to local land use infrastructure	Blast events	Personnel/stock health and/or safety; infrastructure damage/loss	Contemporary blast design, airblast overpressure and vibration monitoring	U				M	L					II
Geotechnical failure of constructed structures and/or landforms	Blasting, wet weather, or a combination of both	Personnel/stock health and/or safety; loss of land	Engineered design for regulated structures (levee); geotechnical advice for landforms, low-walls and high-walls	R				M						II
Impacts to the environment (downstream watercourses) from erosion of rehabilitated areas	Dispersive soil characteristics, rehabilitated landform (slope, surface preparation, revegetation success, climate)	Downstream water quality, operational cost, compliance	Rehabilitation practices, ESC practices	U					M		L			II
Impacts to the environment (surface water and groundwater)	Waste rock inherent geochemical issues	Downstream water quality, flora, fauna, aquatic fauna, operational cost, compliance	Waste rock characterisations, short residence time on stockpiles, mining schedule	U					M					II
Impacts to the environment (land contamination)	Presence of contaminants	Localised land contamination	Appropriate storage of hazardous chemicals and fuels, training	R				L						I
Impacts to the environment and workforce health	Presence of carbonaceous materials (spontaneous combustion)	Air quality, CMW health	Appropriate storage and handling of carbonaceous materials, staff training	R		L			L					I
Surface water														
Impacts to local/regional surface water quality	Catchment disturbance, release of sediment laden waters	Adverse changes to TSS, turbidity, water quality in receiving waterways, HES wetland	Provision of engineered sedimentation structures and ESC measures in accordance with the Project Water Management Plan	U					L					I
Impacts to local/regional surface water quality	Releases of mine affected water	Adverse changes to salinity, water quality in receiving waterways	Water balance, engineered water management system, licensed release conditions	P					L					II
Impacts on surface water resources	Loss of catchment reporting to receiving waterways and wetlands	Impacts to local and regional surface water quality, aquatic ecology and other uses	Water efficiency programs outlined in Water Management Plan	L						VL				II
Groundwater														
Impacts to groundwater quality	Seepage from MAW water storages	Contamination of groundwater	Engineered MAW water storages	U				M	M					II
Impacts to local groundwater resources	Aquifer disturbance, leakage to mine	Aquifer drawdown; diminished resource for other users	Modelling results indicate negligible loss and insignificant leakage to alluvium. (refer Appendix E, section 4.6)	U					M					II
Impacts to local groundwater resource water quality	Aquifer disturbance	Diminished groundwater quality for other users	Modelling results indicate negligible loss and insignificant leakage to alluvium. (refer Appendix E, section 4.6)	U					M					II
Impacts to groundwater dependent ecosystems	Drawdown/leakage to mine	Impacts to stygofauna habitat, springs, HES wetland	Modelling results indicate negligible loss and insignificant leakage to alluvium. (refer Appendix E, section 4.6)	U					L					I

Risk Description				Risk Evaluation										
Risk or Hazard Title	Causes (Triggers &/or Indicators)	Potential Impacts (Consequences)	Inherent Risk with Assumed Expected or Standard Controls	Likelihood / Probability	Greenhouse	Health	Safety	Environment On-site	Environment Off-site	Community Trust	Compliance	Reputation	Cultural Heritage	Risk Management Class
Safety														
Increased safety risk	Steeper landforms, rougher surfaces	Safety, community trust	Landform design compatible with PMLU, exclusion areas and barriers where required	U			VL	M		L				II
Increased incidence of weeds and/or disease	Weed and pest species	Health	Personal protection measures, weed management program, monitoring, raising awareness	P		L								II
Increased incidence of pests	Pest species	Safety	Pest management program, monitoring, raising awareness	R			M							II
Socio-economic														
Negative impacts to the local and regional economy	Equity of economic contribution	Community trust	DIDO with limited FIFO, loss of potential agricultural value, local employment opportunities	P						VL				I
Negative impacts to the local and regional economy	Changes associated with closure	Community trust	Approximate 2-3 year wind-down of operations into closure, existing regional mine density	P						L				II
Cultural Heritage														
Impacts to cultural heritage values	Planned and/or unplanned disturbance	Degradation of cultural heritage values, compliance	CH surveys indicate low risk of presence of CH values; delineation; CHMP	U									L	I
Incident														
Impacts to the environment (surface water, groundwater, land contamination, flora, fauna, air quality)	Significant operational/process incident occurring on site (spill, fire, explosion)	Physical environment (soil, landforms, water source), harm to wildlife, compliance	Emergency response planning and training, staff training and awareness, spill control, bunding and containment practices, and liaison with external emergency responders	R				M	M		M			II
Flora														
Impacts to flora	Land disturbance, increase in pest species	Loss of native flora	Weed management plan (staff training, equipment/vehicle wash-downs)	P				L	L					II
Impacts to flora from bushfire	Project-related activities	Loss of native flora	Containment and control measures, Distance from source, firebreaks, ERT with fire-fighting capacity	R					L					I
Fauna														
Impacts to fauna (disturbance, biosecurity)	Land disturbance, presence of introduced pests and/or disease	Fauna	Site ground disturbance permitting system, weed and land management plan (staff training, equipment/vehicle wash-downs where required)	P					L					II
Impacts to fauna (wildlife interactions)	Driving conditions, workers interacting with wildlife	Vehicular accident, site work injury	Staff training to operate vehicles defensively and staff awareness	L				L	L					III
Impacts to fauna from bushfire	Project-related activities	Fauna, fauna habitat	Onsite containment and control measures, staff training, firebreaks, ERT with fire-fighting capacity	R					L					I
Climate change														
Contribution to climate change	Direct and indirect greenhouse gas emissions from the Project	Localised and regional air quality	Annual review program, efficient and minimal energy use, fuel efficient equipment, equipment maintenance	AC	VL									II
Essential services														
Impacts on essential services (power, telecoms, potable water)	Additional pressure from the Project	Wearing out of service infrastructure, economic (repair and maintenance)	Annual review, efficient and minimal energy use, audit and monitoring provide additional resources as required (e.g. Sewerage Treatment Plant)	P						VL				I
Waste management and disposal	Management non-compliance	Inefficient resource use, vermin	Internal reviews, staff training	P				VL	L	L				II
Future land use														
Loss of land resource value	Construction and operation of the Project	Loss of lands having agricultural value	Post mining land use of equivalent value	U										II
Restrictions on possible future land uses in and around the project area	Post-closure of the Project	Land suitability	Rehabilitation practices, land use assessments, alternative post mining land uses	U				VL						I

Table 7: Identified Class III risks and risk mitigation approach

Risk or hazard title	Causes (triggers &/or indicators)	Potential impacts (consequences)	Inherent risk with assumed expected or standard controls	Risk ranking			Risk mitigation approach
				Health & safety	Environment	Community trust	
Safety: Increased risk of motor vehicle incidents	• Increased light and heavy vehicle movements associated with the Project	Ranges from inconvenience to fatality	• Road access design (subject to regulatory controls) and public road controls	**III**			• Fatigue management/fitness for work • Alcohol and drug testing • Road safety awareness training
Operational OHS hazards	• Construction, mining and industrial activities	• Health and safety • Operational costs	• Staff awareness and training • Safety management system	III			• OHS performance to be closely monitored and assessed and, when required, individual, issue-specific risk assessments to be undertaken to identify fit-for-purpose safety initiatives
Hazardous materials: Storage and use of explosives	• Incorrect storage • Accidental incidents	• Noise/vibration • Fly rock • Unplanned explosion	• Appropriate storage and handling of explosives • Saff training	III			• Employee training • Supervision • Critical controls relating to blast management
Land disturbance: Direct clearing, topsoil removal and earthworks	• Soil characteristics • Weather • Unexpected flora/fauna impacts	• Erosion • Damage to environmental values • Dust	• ESC practices followed • Spotter catchers employed when necessary		III		• Sediment dams • ESC controls • Rapid revegetation
Air quality: Dust impacts to sensitive receptors	• Equipment, processes and vehicle movements on unsealed roads • Increased bare areas (waste rock dumps, TSF)	• Annoyance • Amenity (sensitive receptors) • Harm to wildlife • Crop impact • Contamination of water tanks	• Distance from source • Routine haul road watering • Progressive rehabilitation • Speed limits			III	• Chemical treatment of haul roads • Rescheduling of blasting operations • Reactive dust control measures

Risk or hazard title	Causes (triggers &/or indicators)	Potential impacts (consequences)	Inherent risk with assumed expected or standard controls	Risk ranking			Risk mitigation approach
				Health & safety	Environment	Community trust	
Impacts on fauna (wildlife interactions)	• Driving conditions • Workers interacting with wildlife	• Vehicular accident • Site work injury	• Staff training to operate vehicles defensively • Staff awareness		III		• Monitor fauna interactions via incident reporting; • if required, introduce additional controls (e.g. fencing, ultrasonic deterrent devices etc.

5.1.2 Emergency Response Plan (ERP)

The existing Lake Vermont Mine ERP will be applicable to all phases of the Project, and should be updated as necessary to:

- provide current contact details relevant to emergency management;
- outline the roles and responsibilities of site personnel, including, but not limited to, the:
  - Incident Commander (Project Manager/Site Senior Executive [SSE]);
  - Incident Controller;
  - Emergency Response Team;
  - Supervisors; and
  - mine workers;
- address the range of feasible emergency situations that could occur;
- detail the equipment available to emergency responders;
- provide emergency response training;
- provide regular testing of the site's emergency response capability;
- outline the emergency response procedure to be followed, including raising the alarm and summoning emergency assistance and the termination of emergency response;
- identify emergency communications protocols, including requests for assistance from external emergency services (e.g. Queensland Mines Rescue Service, Queensland Fire and Emergency Services, Queensland Police);
- outline fire response procedures;
- detail evacuation procedures and muster points;
- include maps and relevant GPS information; and
- include duty cards detailing the roles and responsibilities of the Incident Commander, Incident Controller, Emergency Response Team, supervisors and mine workers.

The existing ERP should be maintained in consultation with key external bodies involved in emergency responses relating to site activities, including:

- Queensland Fire and Emergency Services;
- Queensland Mines Rescue Service
- Queensland Ambulance Service;
- Queensland Police Service;
- Rural Fire Service;
- RACQ CQ Rescue Service; and
- Isaac Regional Council (relative to regional emergency plans).

5.1.3 Bushfire Management Plan (BMP)

The existing ERP includes a BMP designed to identify bushfire hazards and outline the response to bushfires. It has been developed in consultation with the Queensland Fire and Emergency Services and is reviewed by the fire officer or Mine Manager prior to each bushfire season. The BMP includes:

- a bushfire hazard analysis for the approaching season;
- fire protection controls and maintenance of controls as required;
- specification of firefighting equipment; and
- strategies to achieve development outcomes of the State Planning Policy to:
    - avoid activities in bushfire hazard areas of the Project when practicable;
    - support the Queensland Fire and Emergency Services;
    - avoid an increase in the severity of bushfire hazard;
    - avoid risk to public safety from hazardous materials; and
    - maintain natural bushfire processes as applicable.

5.1.4 Monitoring and improvement

To ensure the effectiveness of the ERP, the Plan should be periodically tested, audited and reviewed. An investigation should take place after any emergency, and regular training and testing of the emergency response workers should be undertaken.

Monitoring of the SHMS and ERP, and audits of the implementation of management plans should be conducted periodically. Regular inspections should be conducted to ensure that all emergency equipment is working and has been maintained.

6 References

Queensland Government 2020, Queensland Emergency Risk Management Framework (QERMF), Queensland Government, viewed June 2022.

Standards Australia/ Standards New Zealand 2001, *Occupational health and safety management systems - Specification with guidance for use* (*AS/NZS 4801:2001)*, Standards Australia/ Standards New Zealand.

Standards Australia 2012, *Managing environment-related risk (SA/SNZ HB 203-2012)*, Standards Australia (Standards Association of Australia).

Standards Australia 2018, *Risk management - Guidelines (AS ISO 31000:2018)*, Standards Australia (Standards Association of Australia).