Jellinbah Group

LAKE VERMONT MEADOWBROOK EXTENSION PROJECT

ENVIRONMENTAL IMPACT STATEMENT

EXECUTIVE SUMMARY

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ES Executive summary

This Environmental Impact Statement (EIS) has been prepared for the Lake Vermont Meadowbrook Project (the Project) to address the requirements of the *Environmental Protection Act 1994* (EP Act). The objective of the EIS is to identify and assess the potential environmental, social, economic and cumulative impacts of the proposed Project and provide measures to avoid, minimise, mitigate or offset adverse impacts.

This EIS is to be assessed under the bilateral assessment agreement (between the State of Queensland and the Commonwealth of Australia). The bilateral assessment agreement provides accreditation of the Queensland processes for environmental assessment of proposed actions that would otherwise be assessed by the Commonwealth Government for approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This EIS addresses the requirements of the Project Terms of Reference (ToR) and comprises a main text report, supported by a number of appendices and attachments.

The Project is a proposed extension to the existing Lake Vermont Mine to develop the metallurgical coal resource to the north and directly adjoining the existing Lake Vermont Mine. The existing Lake Vermont Mine currently produces approximately 9 Mtpa of product coal. The Project proposes underground longwall mining and an open-cut satellite pit to mine coal seams to the immediate north of the existing Lake Vermont Mine. The Project is approximately 25 km north of the town of Dysart and approximately 160 km south-west of Mackay in the Bowen Basin region of central Queensland (Figure ES. 1).

The Project involves the extraction of up to 7 Mtpa of Run-of-Mine (ROM) coal, equivalent to approximately 5.5 Mtpa of metallurgical product coal, for the export market. The Project addresses the forecast reduction in coal output that will occur at the existing Lake Vermont Mine by combining output from the existing (approved) open-cut operations and the Project extension. This will enable total coal production to be maintained at approximately 9 Mtpa for an additional period of up to 20 years, albeit with production levels continuing to then tail off until Project mining completion in 2055.

The Project is expected to provide long-term economic benefits to the local community, State and Commonwealth. The benefits for the local community will include ongoing employment opportunities for workers currently employed at the Lake Vermont Mine, as well as continued support of local and regional suppliers through the provision of additional security and longevity of employment within the region. At Project full development, the operational workforce for the Lake Vermont Mine Complex (i.e. operation of the existing Lake Vermont Mine together with the proposed Project) is estimated to be 860 workers. Were the Project not to proceed, some 410 direct workforce positions would be lost, with flow-on indirect economic impacts primarily to Dysart and nearby towns. The Project is estimated to provide additional tax revenues of approximately $1,919.4 million per annum to the Australian Government and approximately $1,334.5 million per annum to the Queensland Government.

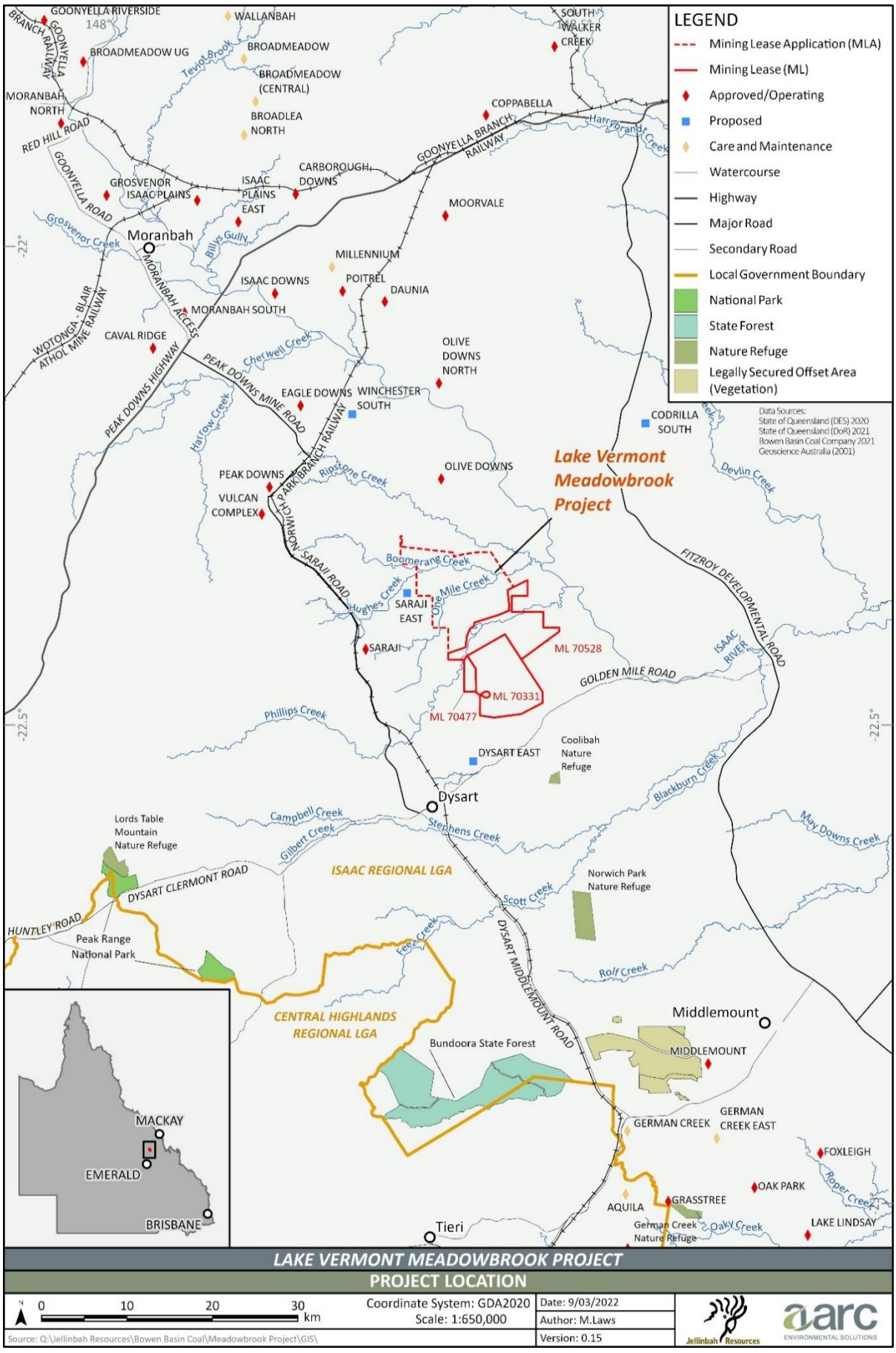

Figure ES. 1: Project location

ES.1 Project proponent

The Proponent for the Project is Bowen Basin Coal Pty Ltd (Bowen Basin Coal) (ABN: 22 065 321 440). The registered address and postal address for Bowen Basin Coal is:

Level 7
12 Creek Street
Brisbane, Queensland, 4000

Bowen Basin Coal is a private company established in 1994 and owned by the Lake Vermont Joint Venture, an unincorporated Australian joint venture operating in Queensland. The Lake Vermont Joint Venture comprises QCMM (Lake Vermont Holdings Pty Ltd) (70%), Marubeni Resources Development Pty Ltd (10%), CHR Vermont Pty Ltd (10%) and Coranar (Australia) Pty Ltd (10%). QCMM is 100% owned by Jellinbah Group Pty Ltd. Lake Vermont Resources Pty Ltd manages the Lake Vermont Joint Venture operations, including the existing Lake Vermont Mine on Mining Lease (ML) 70331, ML 70477 and ML 70528 on behalf of the joint venture participants. Mining at Lake Vermont Mine is undertaken under contract by Thiess Mining Services (Thiess).

ES.2 Project summary

The proposed Project extension footprint lies within MDL 303 and MDL 429. These tenements are held by the Proponent, who will submit a Mining Lease Application (MLA) over MDL 303 and MDL 429 as part of the approvals required to authorise this Project. The MLA covers an area of 8,238 ha.

Approximately 108.6 Mt of underground ROM coal plus 13.3 Mt of open-cut ROM coal is estimated to be mined over the life of the Project, extracting approximately 122 Mt of total ROM coal.

The Project will include underground single and dual-seam longwall mining, open-cut mining and development of supporting infrastructure. Infrastructure proposed to be developed for the Project includes a mine infrastructure area (MIA), an electrical substation, underground portal, drifts and shafts, boreholes to deliver material to the underground workings, and gas drainage bores.

An infrastructure corridor linking the new mining area to existing infrastructure at the Lake Vermont Mine will provide for access, coal haulage, power and water supply, and telecommunications infrastructure for the new mining facilities. Overburden and interburden will be disposed of in out-of-pit waste rock emplacements located contiguous to excavation and in-pit as part of progressive rehabilitation behind the advancing operations.

The area proposed to be directly disturbed by the Project is 827.8 ha, primarily comprising development of the infrastructure corridor, the MIA and Project open-cut mining area. The Project open-cut mining area accounts for 666.4 ha of the direct disturbance. A further 15.3 ha of the direct disturbance is proposed within the existing Lake Vermont leases to support the southern connection of the infrastructure corridor to the existing Lake Vermont Mine infrastructure area. The area expected to be indirectly disturbed (through subsidence-induced ponding impacts and associated mitigation measures) is 214.0 ha. Disturbance will be staged in accordance with the scheduled Project activities. The proposed Project layout is provided in Figure ES. 2.

The Project will utilise existing infrastructure and facilities at the Lake Vermont Mine to minimise Project disturbance and maximise Project efficiencies. ROM coal will be transported using road trains *via* a sealed haul road to the existing Lake Vermont coal handling and preparation plant for processing. Product coal will be railed *via* the Goonyella and Blackwater Rail System to the RG Tanna Coal Terminal in Gladstone, the Abbot Point Coal Terminal in Bowen or the Dalrymple Bay Coal Terminal in Mackay for sale to export markets. The Project schedule has been developed to integrate with the ongoing operation of the approved Lake Vermont Mine. Consequently, no additional infrastructure or modifications to the existing product coal handling processes are required for the Project.

All land disturbed by mining activities will be rehabilitated to achieve a post-mining land use. Rehabilitation will occur progressively during the mine life in accordance with the Progressive Rehabilitation and Closure Plan (PRCP) (Appendix B, Progressive Rehabilitation and Closure Plan) for the Project, which is provided to the Department of Environment and Science (the approval authority) as part of this EIS documentation.

ES.3 Public consultation process

Stakeholder engagement and community consultation have been undertaken during the preparation of the EIS in accordance with the 'International Association for Public Participation (IAP2) Code of Ethics for Public Participation Practitioners' (IAP2 2019) as well as 'Australia's National Statement on Ethical Conduct in Human Research' (NHMRC 2007). Consultation with local communities has been conducted as part of the Social Impact Assessment for the Project (Appendix P, Social Impact Assessment, Section 4 and 5).

The primary means of stakeholder engagement has been *via* semi-structured interviews and meetings with targeted stakeholders. This was determined to be the most effective way to meaningfully engage and gain genuine input from stakeholders into social impact definition and management.

Bowen Basin Coal will undertake ongoing stakeholder consultation during the construction, operation and decommissioning/rehabilitation phases of the Project.

ES.4 Project description

ES.4.1 Construction

Construction and mine development activities are scheduled to commence subject to, and following the approval of, proposed amendments to the Lake Vermont Mine environmental authority (EA) and granting of the mining lease.

Construction of the underground extension is forecast to commence in fiscal year 2024 (being Project Year-1) and will continue for approximately 24 months (throughout Project Year-1 and Project Year 0).

The construction period will include the following activities within the mining lease:

- clearing vegetation from the areas where infrastructure is to be constructed;
- stripping and stockpiling of topsoil for later use in rehabilitation;
- constructing the mine infrastructure corridor, including:
    - a haulage road for personnel, material and coal haulage;
    - watercourse crossings at Phillips Creek and One Mile Creek;
    - an overhead 66 kV electricity transmission line;
    - a raw water pipeline;
    - two laydown areas to support construction activities; and
    - telecommunications infrastructure;
- constructing the following key components within the MIA:
    - mine administration and operations buildings, including crib room, ablution, first aid and emergency management facilities;
    - bathhouse facilities;
    - warehouse and stores compound;
    - equipment hardstand and laydown areas;
    - equipment maintenance workshop and service bays;

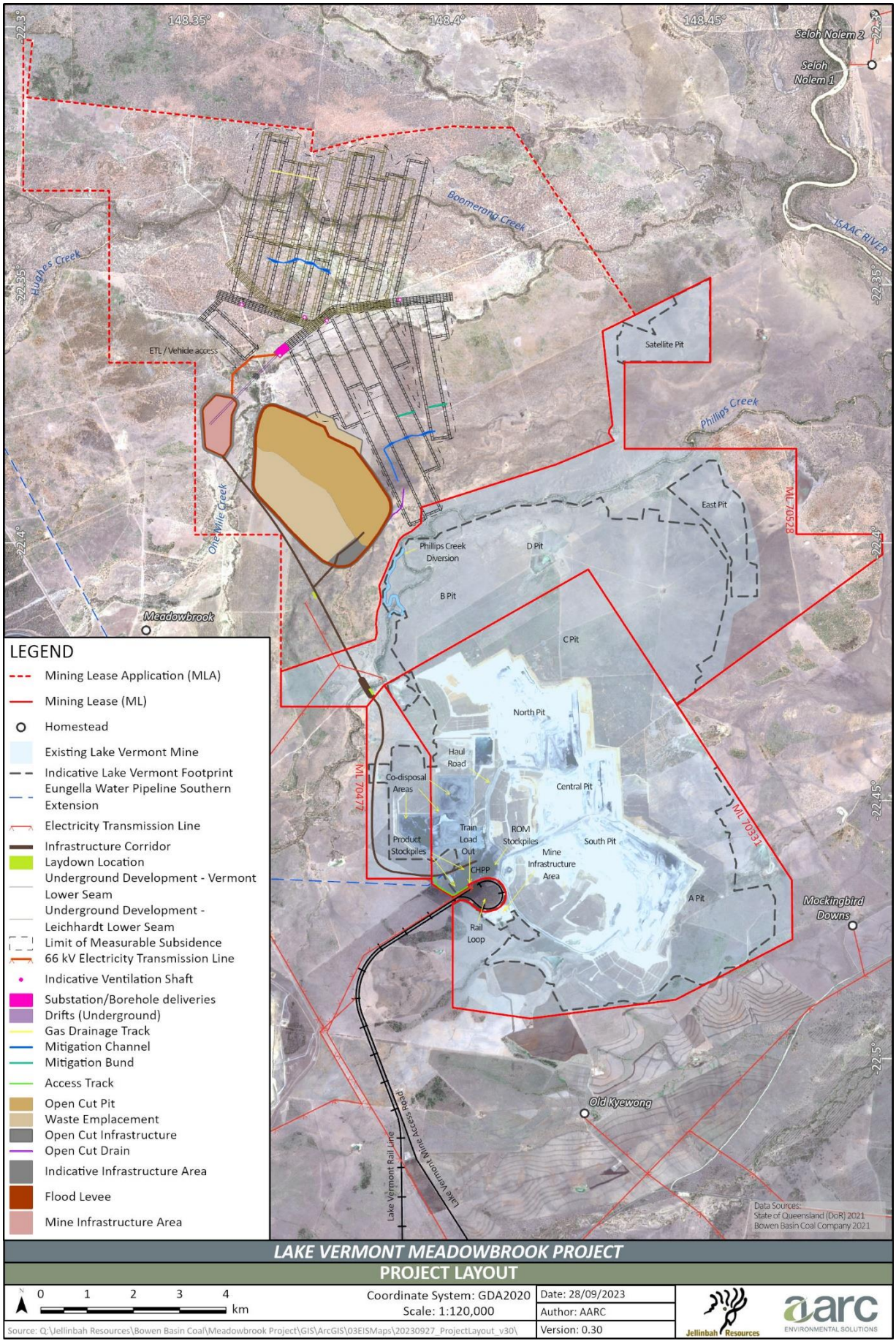

Figure ES. 2: Project layout

  - diesel storage and refuelling bay;
  - underground transport mustering area;
  - underground portal access to a personnel and transport drift, as well as a conveyor drift;
  - ROM coal stockpile and associated infrastructure, including coal haulage loading area;
  - flood protection levee;
  - electricity distribution infrastructure;
  - diesel backup generator;
  - main surface fan installation;
  - potable water treatment plant;
  - sewage treatment plant (STP) and effluent irrigation areas; and
  - other associated minor ancillary infrastructure;
- constructing ventilation shafts;
- constructing the electrical substation; and
- constructing the mine water management system, including:
  - raw water dam;
  - mine-affected water dams;
  - associated drainage structures; and
  - a diversion drain to divert clean water around the MIA.

The MIA flood protection levee will be designed to protect infrastructure within the MIA from a 0.1% AEP flooding event. A further flood protection levee is proposed to be constructed as part of the Project satellite open-cut pit development (during the Project operational phase). The flood protection levees has been designed in accordance with the 'Manual for Assessing Consequence Categories and Hydraulic Performance Structures' (DES 2016) and the guideline 'Structures which are dams or levees constructed as part of environmentally relevant activities' (DES 2022).

The location of mining infrastructure has been selected to minimise vegetation clearance. The locations of infrastructure corridor crossings at Phillips Creek and One Mile Creek have been selected by utilising existing light vehicle crossings to minimise damage to the bed and banks of the watercourses. No diversions of defined watercourses are proposed for the Project.

ES.4.2 Operations

Year 1 of coal production will commence following the 24-month construction period.

The Project mine layout, sequencing and mining methods have been designed or selected to maximise resource extraction and minimise resource waste, resource sterilisation and environmental impacts. The Project coal reserve will be mined using underground and open-cut mining methods. The primary underground target seam is the Vermont Lower seam that extends across the whole underground footprint. The overlying Leichhardt Lower seam, which is a secondary underground target seam, is only present across the northern half of the underground footprint. Open-cut mining of coal reserves from the Leichhardt Lower, Vermont and Vermont Lower seams will occur within the Project satellite open-cut pit.

The depth of the coal resources and thickness of the coal seams across the Project are such that underground longwall mining will provide the most effective method of extraction. Continuous miner units will be utilised to drive the in-seam access headings to enable longwall operations to commence. Approximately 22 months of initial in-seam development using continuous miners is planned before the longwall commences operation.

It is planned to extract the southern longwall panels first by progressing from west to east. As the longwall completes the southern panels in the Lower Vermont seam, in-seam development work will commence in the northern panels in the overlying Leichhardt Lower seam. Upon completing extraction of the southern Vermont Lower seam panels, the longwall will commence mining the northern Leichhardt Lower seam panels. Once the northern Leichhardt Lower seam panels have been extracted, mining will recommence in the Vermont Lower seam to extract the northern Vermont Lower seam panels.

The Project open-cut satellite pit will commence operation in Project Year 20 when the underground mine is nearing completion. The Project open-cut satellite pit will be a terrace mining operation that will initially commence in the south and progress north to the centre of the mining area. Mining will then relocate and commence in the north and progress to the south. Overburden and interburden will be disposed of in out-of-pit waste rock emplacements located contiguous to the excavation, and in-pit behind the advancing operations as part of progressive rehabilitation. This mining sequence and associated backfilling will result in the final rehabilitated pit landform providing a post-mining land use of grazing (consistent with the pre-mining land use). This progression (and commitment to backfilling) will ensure that no pit void is retained post-mine closure.

ES.4.3 Rehabilitation

The natural landscape in the Project area will be altered through the formation of in-pit and out-of-pit waste rock emplacements, the formation of a rehabilitated pit, and subsidence from the progression of longwall mining and associated mitigation measures. Disturbed lands will be returned to a safe and stable landform that does not cause environmental harm and will sustain an approved post-mining land use. Land disturbed by mining operations will be progressively rehabilitated.

The Proponent's objective is to reinstate the land use of low-intensity cattle grazing by returning the land to a similar suitability to that existing prior to mine disturbance. This objective is consistent with the current land use and retains the existing economic benefits realised pre-mining. While alternative post-mining land uses (PMLUs) have been assessed, this PMLU is determined to be feasible considering the land suitability.

Material from the out-of-pit waste rock emplacements will be used to partially backfill the open-cut pit at the completion of mining, with the final landform comprising the residual out-of-pit waste rock emplacement and a surface depression within the pit footprint area, which will be subject to intermittent periods of ponding.

Areas subject to subsidence from the progression of longwall mining will be progressively rehabilitated to address impacts from erosion, surface cracking, ponding and geomorphological changes.

Mine infrastructure (including buildings, dams, flood levees, water pipelines and pumps, and aboveground infrastructure supporting underground operations) will be decommissioned and the areas rehabilitated, unless otherwise required for post-mining land use. Infrastructure proposed to be retained post-closure includes the haul road and the MIA dam (which will be rehabilitated as a stock watering dam). Retained infrastructure is consistent with the proposed PMLU of grazing and will provide a tangible benefit.

A PRCP has been developed for the Project and is provided as Appendix B, Progressive Rehabilitation and Closure Plan, of this EIS. For the purposes of developing the PRCP schedule, 14 rehabilitation milestones have been proposed as being applicable to the Project. Rehabilitation milestones are defined as each significant event or step necessary to rehabilitate an area of land to a stable condition.

A Rehabilitation Monitoring Program has been developed with clear definitions of each milestone criteria to determine the achievement of rehabilitation milestones.

ES.5 Environmental assessment

ES.5.1 Climate

The Project is within a hot arid and semi-arid subtropical region with moderately dry winters and hot, moderately wet, humid summers (BoMs modified Köppen Climate Classification System, BoM 2021). The SILO Meadowbrook Grid calculated mean daily temperatures of approximately 16.3°C to 29.3°C (BoM 2022). Nearby weather stations have recorded a mean annual rainfall of approximately 600 mm. Wind directions of the region vary from dominant north-easterlies during spring to very dominant south-easterlies in autumn and winter at light to moderate speeds.

The Project is located in an area subject to natural and induced climate hazards including bushfire, extreme rainfall, flooding, extreme temperatures and to a lesser extent cyclones. Climate change is projected to influence these hazards with an increased risk of bushfire, an increase in extreme temperatures and decreased risk of rainfall extremes and therefore lowered risk of flooding (Appendix V, Climate Change Assessment, Section 7.5.3).

Mitigation and management measures have been developed to reduce or avoid impacts of climate hazards on the Project, including the following:

- Mitigation for impacts of higher-than-average temperatures, including:
    - maintaining existing site practices (that manage occupational exposure to extreme temperature conditions);
    - energy supply system designed for predicted extreme temperatures; and
    - hardening off and establishment measures for rehabilitation plantings.
- Mitigation measures for increased occurrence of bushfires, including:
    - constructing fire breaks and undertaking hazard reduction burns;
    - provision for accessibility to critical infrastructure and emergency response equipment in Project design; and
    - early fire detection and water sprinkler systems for critical areas.
- Developing infrastructure designed to meet local cyclone protection standards.
- Constructing levees to protect key infrastructure areas from flooding and extreme rainfall events.
- Mitigation measures for decreased average annual rainfall, including:
    - developing a PRCP that considers climate hazards and climate change; and
    - establishment support for rehabilitation plantings.

ES.5.2 Land

The Project is on a broad, flat floodplain with elevations ranging between 160 mAHD and 190 mAHD. The topography of the Project area is representative of the surrounding region. Ground elevations to the west of the Project are marginally higher in elevation (approximately 10 mAHD), with the Project generally draining west to east towards the Isaac River.

The current land use of the Project site is rural (low-intensity cattle grazing) and resource exploration activities. The Project area adjoins several existing coal mining operations. The vegetation of the Project area can be described as a combination of introduced pasture, natural bushland and regrowth of native bushland.

The southern portion of the Project area intersects with the north-western portion of the Golden Mile Important Agricultural Area (IAA), constituting approximately 5,672 ha of the Project area. Disturbance associated with the Project area will potentially disturb 896 ha, or less than 0.1%, of the Golden Mile IAA.

A 6 ha portion in the south-eastern corner of ML70477 is designated as potential SCL according to the Queensland Government SCL trigger mapping. There will be a permanent impact to approximately 3 ha of trigger mapped SCL for which a Regional Interests Development Approval (RIDA) application has been submitted.

Mitigation and management measures have been developed to reduce or avoid impacts to local land values arising from Project disturbance, including:

- development and implementation of a Subsidence Management Plan to direct monitoring, management and mitigation measures for subsidence impacts;
- updating and implementation of the existing Lake Vermont Mine Topsoil Management Plan to direct topsoil removal, stockpiling and placement;
- implementation of a land disturbance permit system to control and limit Project disturbance activities to within the authorised footprint and to manage environmental and cultural heritage features;
- implementation of erosion and sediment controls to minimise erosion (through an updated Lake Vermont Mine Water Management Plan); and
- progressive rehabilitation of disturbed land (in accordance with the PRCP developed for the Project).

ES.5.3 Water

The Project is within the Isaac-Connors Sub-catchment of the greater Fitzroy Basin. The Isaac River is the main watercourse in the vicinity of the Project area, with a catchment of approximately 4,100 km^2. The Isaac River catchment commences at the Denham Range, approximately 97 km north of the Project. The Isaac River flows in a south-westerly direction through the Carborough and Kerlong Ranges before turning in a south-easterly direction near the Goonyella Riverside Mine. The Isaac River converges with the Connors River and then the Mackenzie River approximately 150 km downstream of the Project. Ultimately, the Mackenzie River joins the Fitzroy River, which flows initially north and then east towards the east coast of Queensland, discharging into the Coral Sea south-east of Rockhampton, near Port Alma.

ES.5.3.1 Groundwater

A conceptual hydrogeological model of the groundwater regime at the Project has been developed and informed by site conditions and previous regional model development. There are four main hydrogeologic units in the Project area:

1) Cainozoic (Quaternary and Tertiary) alluvial sediments associated with Boomerang Creek and Phillips Creek;

2) Triassic Rewan Group sandstone;

3) Late Permian Rangal Coal Measures, the coal-bearing sediments that contain the target coal seams for the Meadowbrook Project (Leichardt Lower and Vermont Lower seams); and

4) Late Permian Fort Cooper Coal Measures, which subcrops beneath the Tertiary sediments.

The Tertiary sediments and Permian coal seams groundwater flow direction is generally from west to east, following the general topography towards the Isaac River. Flows in the coal seams are truncated by faults such as the Isaac Fault. However, groundwater flows are driven laterally at these features or over these features to continue the general flow direction. The existing Lake Vermont Mine acts as a sink for groundwater flow within the coal seams, and there is a component of groundwater flow that is southwards towards the Lake Vermont open-cut pit.

Groundwater recharge is predominately through rainfall and downward seepage from ephemeral creeks following creek flow. This occurs directly to the Tertiary and Quaternary groundwater units. The Permian Coal Measures are preferentially recharged where coal seams subcrop beneath Tertiary or Quaternary sediments. Recharge to the coal seams appears to be enhanced where creeks flow over the subcrop area.

The mean electrical conductivity of groundwater is greater than 20,000 µS/cm at most monitoring bores in the Project area. South of the Project area at the Lake Vermont North monitoring bores, the mean electrical conductivity is greater than 10,000 µS/cm. Sites influenced by recharge from Philips Creek exhibit lower electrical conductivity. The Tertiary sediments recorded high electrical conductivity values, indicating that the unit is variably saturated and has poor hydraulic connection with the underlying sediments. Groundwater in the Project area is generally neutral to very slightly acidic across all units. Metal concentrations are generally below the limit of reporting.

Groundwater in the broader Project region is primarily used for livestock watering and domestic use. No domestic use of groundwater has been identified to occur within the Project area. Landowner bores within the Project region primarily target the Isaac River alluvium, as well as Tertiary and Permian sediment groundwater units. Seventeen registered bores were identified within the potential impact area. For the majority of bores screened within the Isaac River alluvium, the Department of Resources Groundwater Database describes the water quality simply as "good". For bores within the Permian sediments, groundwater has EC values ranging from 4,000 µS/cm to 7,290 µS/cm and, as a result, has marginal value for livestock watering use.

Other possible types of groundwater uses in the Project region include use by groundwater-dependent ecosystems (GDEs), stygofauna and wetlands.

Potential impacts of the Project on groundwater resources post-mining have been predicted using a numerical groundwater flow model, and include:

- minor impacts on drawdown within the Quaternary sediments, as the strata is only seasonally saturated;
- 20 m drawdown in the Tertiary sediments over most of the underground mining area and 1 m of drawdown predicted to extend east to the confluence of Boomerang Creek and Ripstone Creek;
- a groundwater mound will develop beneath the rehabilitated pit landform due to seepage of water located at the depression (at the base of the landform). The mound is predicted to be approximately 4 m above the pre-mining groundwater level, resulting in radial seepage from the final landform area to the Tertiary sediments; and
- groundwater levels in the Rewan Group and Permian Rangal Coal Measures sediments (approximately 4 m above the pre-mining groundwater level), with the raised groundwater centred on the rehabilitated open-cut landform.

Modelled inflows into the underground workings are estimated to be six litres per second, with a maximum of 10 litres per second and a minimum of 0.4 litres per second predicted over the Project life. The volume of groundwater predicted to be taken over the life of the underground mine is 5,110 ML—an average of approximately 204 ML per year.

Average net groundwater inflow for the life of the Project open-cut, including evaporation, is predicted to be 2.45 litres per second, with a maximum inflow of 5.1 litres and a minimum inflow of 0.4 litres per second. The volume of water to be removed from the formation during the active phase of mining is calculated at 2,086 ML, and allowing for evaporation, the total predicted net pit inflow over the active period of mining will be 623 ML.

The Project open-cut satellite pit will be progressively backfilled during the operational and rehabilitation phases of the Project. The final rehabilitated pit landform will present with a shallow depression in the central mining area, with a floor elevation above the anticipated recovered groundwater level. Seepage of surface water is predicted to occur from the rehabilitated pit landform to the underlying formations. The electrical conductivity of this seepage is predicted to be a maximum of 1,460 µS/cm, which is much lower than the mean EC of the underlying groundwater system. Seepage of water from the rehabilitated pit landform is, therefore, assessed to be unlikely to present a significant risk to groundwater quality.

There is one bore screened in Cainozoic sediments within the 2 m drawdown area of the Tertiary strata, potentially requiring a make good agreement to address the potential impacts on this bore. The bore is owned by BMA, with discussions already commenced to determine if a make good agreement is required.

A number of mitigation measures are proposed to minimise the impacts of the Project on groundwater, including:

- continuing the Project groundwater monitoring program to build on the existing baseline dataset and, thereafter, to assess the groundwater levels and quality against groundwater trigger levels and limits at quarterly intervals for the duration of the Project;
- updating and maintaining the existing Lake Vermont Mine Water Management Plan;
- preparing and implementing a Groundwater-Dependent Ecosystem Monitoring and Management Plan; and
- conducting an annual assessment of changes in water levels against model predictions and re-running the numerical model every five years, if required.

ES.5.3.2 Surface water

The Project area drains into the Isaac River, which flows in a south-easterly direction to the east of the Project. The tributaries of the Isaac River in the vicinity of the Project include:

- Boomerang Creek;
- Hughes Creek;
- One Mile Creek;
- Phillips Creek; and
- Ripstone Creek.

All waterways and drainage lines in the vicinity of the Project area are ephemeral and experience flow only after sustained or intense rainfall in the catchment. The proposed underground mining operations will underly Boomerang Creek and One Mile Creek and the floodplain of Phillips Creek. The proposed open-cut operations will be between Phillips Creek and One Mile Creek. Phillips Creek, Hughes Creek/Boomerang Creek and One Mile Creek are defined watercourses under the *Water Act 2000* (Qld). Mining activities upstream at Peak Downs Mine and Saraji Mine have historically altered flow paths, with major diversions of Ripstone Creek, Boomerang Creek, East Creek, Hughes Creek, One Mile Creek, Spring Creek and Phillips Creek. Lake Vermont Resources has approval for a proposed diversion of Phillips Creek adjacent to the Project area, and Pembroke Resources has approval for a diversion of Ripstone Creek, both of which have not yet been constructed.

Surface water environmental values identified for the Isaac River Sub-basin and deemed relevant to the Project's area of influence are aquatic ecosystem values and suitability for stock watering.

Potential surface water impacts include:

- impacts on the environmental values of waterways due to erosion and sediment release to receiving waters;
- impacts on the environmental values of waterways due to uncontrolled water releases;
- impacts on the environmental values of waterways due to mine drainage from waste rock emplacements;
- impacts on the environmental values of waterways due to litter, waste and spills; and
- harm to humans, the environment and economic loss due to dam break or failure to contain seepage or overtopping.

Modelling indicates that overflows from Project sediment dams (which will be developed to support open-cut mining) may occur, with sediment dams designed to contain a 1:10 year ARI, 24 hour event. Median total Project releases from sediment dams are expected to be less than 140 ML from each dam over the total Project life. Modelled salinity of sediment dam overflows indicates that overtopping events will have minimal impact on downstream environmental values. Nutrient releases are also considered unlikely. The MIA dam adopted storage capacity is predicted to be sufficient to contain inflows throughout the Project life without overtopping.

The landform of the rehabilitated pit will at times hold a shallow, intermittent water body, with maximum salinity of water predicted to be approximately 1,460 µS/cm, being below the 'low risk' trigger value of the applied livestock drinking water guideline.

The mine-affected water system, which will manage runoff and groundwater inflows from the underground, Project open-cut satellite pit, ROM stockpile and MIA, is a closed system designed to prevent releases of mine-affected water to the environment. No controlled releases will be used in the water management system to manage stored site inventories.

A number of mitigation and management measures have been proposed to minimise impacts of the Project on surface water, including:

- The water management system for the Project has been developed to minimise potential water quality impacts on the receiving environment and achieve the environmental objectives for water quality that are to be met under the EP Act; namely, to protect the environmental values of waters, wetlands and GDEs, groundwater and any associated surface ecological systems.
- The mine-affected water system will manage runoff from the ROM stockpile and MIA, groundwater inflows from the underground mine, and water collected within the open-cut pit. It will be a closed system designed to prevent releases of mine-affected water to the environment.
- Sediment dams will capture runoff from the open-cut waste rock emplacements to reduce concentrations of solids prior to the reuse of water.
- Catchment of clean water will be minimised by diverting clean water from undisturbed areas around operations.
- Potable water and sewage water will be managed on-site, with effluent irrigation areas to be located within the MIA levee.
- The Lake Vermont Mine Water Management Plan will be updated to include monitoring requirements for the Project.
- The Lake Vermont Mine Receiving Environment Monitoring Program will be updated to provide for monitoring of potential impacts resulting from the Project.

ES.5.4 Flooding

Mining activities associated with the Project have the potential to impact flooding behaviour in areas adjacent to, upstream and downstream of the Project. Temporary flood protection levees will be constructed around the MIA (during the Project construction phase), and around the open-cut mining area (prior to commencement of open-cut mining in Project Year 20), to protect infrastructure and the pit from potential inundation. Flood levees will be designed to provide protection during 0.1% AEP events and withstand the predicted velocities.

The Flood Modelling Assessment (Appendix Z, Flood Modelling Assessment, Section 3 and 5) presents the current flood risk for a range of Annual Exceedance Probability (AEP) events; namely, 50%, 10%, 2%, 1% and 0.1% and Probable Maximum Flood (PMF) design flood events. Flood mapping for peak flood depth, velocity and flood inundation duration has been modelled for:

- pre-mining approved conditions (i.e. current situation without the Project);
- Mine-developed conditions (i.e. at Project Year 26, indicatively 2051);
- post-closure scenarios; and
- cumulative impact scenarios.

The Flood Modelling Assessment for the modelled mine-developed conditions scenario indicates that:

- Underground mine subsidence would locally reduce flood levels but increase the depth and extent of flooding.

- Subsidence would increase floodplain storage, which would reduce downstream flood flows, levels and extents for 50% and 10% AEP flood events at Phillips Creek, One Mile Creek and Boomerang Creek to between 50 mm and 100 mm.
- For the 10% AEP event over the subsidence panels on the Phillips Creek floodplain downstream of the open-cut mine, reductions in flood levels would be up to 2 m in some areas. In larger events, reductions in level would be smaller and within the range of 700 mm to 850 mm.
- For the subsidence areas on One Mile Creek, reductions in levels would range from 1 m to 700 mm.
- Along Boomerang Creek, some flood levels would reduce by as much as 3 m in the 10% AEP event to 2.5 m in the PMF in the most affected locations.
- Afflux downstream of the mine lease area would be negative for all events, ranging from a 600 mm reduction at the Isaac River in the 50% AEP to 300 mm in the 10% AEP. Reductions in the floodplain of the Isaac River in the larger events (from the 2% AEP to the PMF) would range from 60 mm to 100 mm.
- In the 0.1% AEP and PMF events, there would be some positive afflux in the vicinity of the confluence of the Boomerang and Isaac Rivers of approximately 30 mm to 50 mm.
- In the 1% AEP event for regional flooding conditions, off-lease impacts would be limited to the Phillips Creek northern floodplain, with reductions of up to 100 mm just south of the Satellite pit and small increases of 30 mm on the western side of the Satellite pit.
- In the 0.1% AEP flood event, reductions downstream in the Phillips Creek northern tributary would be approximately 150 mm.
- There would be no significant changes in velocity downstream of the mine lease area in design flood events.
- Across the range of events, the subsidence panels would typically experience velocity reductions up to 0.5 m/s and velocity increases between the panels of up to 0.7 m/s (with some areas experiencing increases of up to 1.2 m/s).
- The Phillips Creek floodplain near the south-eastern corner of the open-cut mine is predicted to experience the greatest velocity increases. Modelled point velocity increased the range from 0.8 m/s in the 10% AEP event to approximately 1.3 m/s in the 2% and 1% AEP events and up to 1.5 m/s in the 0.1% AEP event. These velocity increases would be temporary until the operational pit protection levee was decommissioned.
- In the 2% and 1% AEP events, increases of 0.2 m/s would occur upstream of the haul road in the channel of Phillips Creek, and increases of 0.1 to 0.2 m/s would occur along the haul road on the Phillips Creek northern floodplain.
- Minimal upstream velocity impacts are predicted for the 50% and 10% AEP floods. Minimal increases in velocity are predicted in the 0.1% AEP event.

Mitigation and management measures have been proposed to minimise impacts of the Project on flooding, including:

- The flood protection levees will be inspected by a suitably qualified and experienced person in advance of the wet season each year.
- Diversion drains will be constructed to support the management of surface water drainage around the proposed levee structures.
- The haul road embankments and associated cross-drainage structures will be designed to mitigate obstruction of floodplain and channel flows.
- Mitigation drains will be constructed to minimise ponding above subsided panels on the northern Phillips Creek floodplain and the floodplain between One Mile Creek and Boomerang Creek.
- Mitigation bunds will be constructed across the panels in the Phillips Creek floodplain to maintain flows in the minor drainage paths during flood conditions and reduce the potential for Phillips Creek floodwater to be diverted to One Mile Creek in minor floods.

- The landform surrounding the rehabilitated pit will be shaped to protect the final pit landform (depression) from surface water ingress for 0.1% AEP flood events.

ES.5.5 Geomorphology

A geomorphology assessment (Appendix W, Geomorphology Assessment, Section 4) has been undertaken to assess the potential impacts of the Project on the geomorphology of streams traversing the Project area. The assessment modelled the potential effects on the geomorphological behaviour of the channels and floodplains of Boomerang Creek and One Mile Creek for the 50% and 2% AEP events under the 2051 development conditions scenario.

The Project has the potential to affect flow velocities on the floodplain. Flow velocities are predicted to be reduced across subsidence troughs in the floodplain. This will promote the deposition of sediment in these areas and the surrounding floodplain, resulting in the gradual accretion of floodplain depressions. Flow velocities are predicted to increase in areas where overbank floodwater drains into subsidence troughs, with the potential to cause localised erosion. However, this is considered unlikely to cause significant alterations to floodplain morphology.

Changes to Boomerang Creek and One Mile Creek channel morphology are predicted, including:

- decreases in channel velocity, bed shear and stream power in subsidence troughs;
- increases in channel velocity, bed shear and stream power where channels drain into the subsidence zone, potentially increasing bed and bank erosion; and
- increases in channel velocity, bed shear and stream power where flow enters subsidence troughs.

A subsidence monitoring program will be implemented (as part of the proposed Subsidence Management Plan) to enable ongoing assessment of the extent of channel changes, including changes in bed levels and the impact of increased localised sedimentation. Incidental management measures including bank protection, will also be considered if monitoring indicates that the increase in erosion is having a demonstratable impact on channel form. As such, the Subsidence Management Plan will provide for adaptive management processes.

ES.5.6 Flora and fauna

ES.5.6.1 Terrestrial flora

Results from the terrestrial ecology field surveys indicate that most of the Project area (5,431 ha) is occupied by cleared agricultural areas, with some areas of high value regrowth also identified. A total of 15 remnant regional ecosystems (REs) have been identified within the Project area:

1) RE 11.3.1, Remnant Brigalow woodland on alluvial plains.
2) RE 11.4.8, Remnant Dawson Gum woodland with Brigalow on undulating Cainozoic clay plains.
3) RE 11.4.9, Remnant Brigalow with Yellowwood woodland with occasional Dawson Gum on Cainozoic clay plains.
4) RE 11.3.2, Remnant Poplar Box woodland on alluvial plains.
5) RE 11.3.3, Remnant Coolibah woodland on alluvial plains.
6) RE 11.3.4, Remnant Eucalypt and Bloodwood spp. woodland on alluvial plains.
7) RE 11.3.9, Remnant Poplar Gum and Clarkson's Bloodwood woodland on floodplains.
8) RE 11.5.3, Remnant Poplar Box with occasional Clarkson's Bloodwood and Silver-leaved Ironbark woodland on sand plains.

9) RE 11.5.8c, Remnant Poplar Gum woodland on Cainozoic sand plains.

10) RE 11.5.9c, Remnant Narrow-leaved Red Ironbark woodland on Cainozoic sand plains.

11) RE 11.5.12, Remnant Clarkson's Bloodwood and Poplar Gum woodland, often with a dense low tree layer dominated by Paperbark Tea-tree.

12) RE 11.3.25, Remnant River Red Gum or Blue Gum woodland fringing drainage lines.

13) RE 11.3.27b, Remnant River Red Gum, Poplar Gum and/or Blue Gum fringing lacustrine wetlands.

14) RE 11.3.27f, Remnant Coolibah open woodland fringing palustrine wetlands.

15) RE 11.5.17, Palustrine swamp with fringing Blue Gum woodland in depressions on Cainozoic sand plains and remnant surfaces.

REs 11.3.1, 11.4.8, 11.4.9 and 11.5.17 are listed as 'Endangered' under the *Vegetation Management Act 1994* (VM Act). REs 11.3.2, 11.3.3 and 11.3.4 are listed as 'Of Concern' under the VM Act.

Two Threatened Ecological Communities (TECs) (Matters of National Environmental Significance [MNES]) under the EPBC Act are also present within the Project area; namely Brigalow TEC and Poplar Box TEC. These TECs are listed as 'Endangered' under the EPBC Act.

No conservation significant flora species have been observed within the Project area.

The Project would require the clearance of approximately 12.2 ha of remnant vegetation over the life of the Project, and the subsidence ponding areas are predicted to affect approximately 96.9 ha. Native vegetation communities/REs, which would be cleared due to the Project, occur more widely in the surrounding landscapes and subregions; less than 0.02% of the total remnant REs within the Isaac-Comet Downs subregion would be cleared by the Project.

Thirty-five introduced flora species have been identified within the Project area. Of these, seven are listed as restricted matters under the *Biosecurity Act 2014* (Qld):

1) Harrisia Cactus;

2) Balloon Vine;

3) Parthenium;

4) Common Prickly Pear;

5) Lantana (*Lantana camara*);

6) Rubber Vine; and

7) Velvety Tree Pear.

No species listed as Biosecurity Act prohibited matters have been identified within the Project area. Five of the introduced flora species are Weeds of National Significance. Exotic pasture grasses, such as Buffel Grass, dominate the ground layer, both within remnant and non-remnant vegetation. A range of other introduced grasses and forbs are also present across the study area in low to moderate abundance. The Project is unlikely to increase weed populations or result in the introduction of new weed species.

Mitigation and management measures are proposed to minimise impacts of the Project on terrestrial ecology values, including:

- establishing vegetation clearing protocols;
- preparing and implementing a Clearance Management Program;

- conducting pre-clearing inspections to identify the presence or likely presence of animal breeding places for threatened or near-threatened species;
- revising the existing Lake Vermont Mine Pest and Weed Management Plan (where appropriate) and implementing it for the Project;
- undertaking progressive rehabilitation;
- undertaking drainage mitigation measures to reduce areas of ponding created by subsidence;
- preparing and implementing a Subsidence Management Plan that provides for monitoring, management and mitigation measures for potential subsidence impacts;
- updating of the existing Lake Vermont Mine Waste Management Plan and implementing waste management measures to prevent the creation of conditions likely to favour pest species, with particular regard to pest species identified as potentially impacting TECs; and
- preparing an Emergency Response Plan and implementing bushfire prevention measures (particularly relevant to avoiding impacts on TECs).

Based on the results of significant impact assessments, biodiversity offsets will be provided for significant residual impacts to MNES flora (Brigalow TEC and Poplar Box TEC) and MSES flora (regulated vegetation, REs within mapped vegetation management wetlands and REs within the defined distance of a vegetation management watercourse). A Biodiversity Offset Strategy has been developed to offset significant impacts on MNES in accordance with the *EPBC* Act. Residual state-based offsets are also proposed, consistent with the *Environmental Offsets Act 2014* and the 'Queensland Environmental Offsets Policy'.

ES.5.6.2 Terrestrial fauna

Five fauna species listed as threatened under the EPBC Act and *Nature Conservation Act 1992* (NC Act) have been identified during the field surveys; namely,

1) the Ornamental Snake
2) Squatter Pigeon (Southern)
3) White-throated Needletail
4) Koala; and
5) Greater Glider.

All of these species are listed as Vulnerable under the EPBC Act and the NC Act for the purposes of this assessment, with the exception of the Greater Glider, which is listed as Endangered under the NC Act.

The EPBC Act listing for the Koala changed to endangered in early 2022 and the EPBC Act listing for the Greater Glider changed to Endangered in July 2022, after the controlled action decision for the proposed Project was made under s75 of the EPBC Act dated 22 November 2019 (EPBC ref:2019/8485). This assessment considers the impacts on the Koala and Greater Glider as EPBC Act vulnerable listed species in accordance with the listing at the time of the controlled action decision for the Project.

The Short-beaked Echidna, listed as a non-migratory Special Least Concern species under the NC Act, has also been recorded during the surveys.

An additional threatened species, the Australian Painted Snipe, is considered to have a moderate likelihood of occurring within the Project area.

Two species listed as migratory under the EPBC Act and as Special Least Concern (migratory) species under the NC Act have been recorded by the surveys:

1) the White-throated Needletail (also listed as Vulnerable); and

2) the Crested Tern.

Based on the results of the significant impact assessment, biodiversity offsets will be provided to mitigate impacts on the Ornamental Snake, Koala and Greater Glider in accordance with the *EPBC* Act 'Environmental Offsets Policy'.

Nine introduced fauna species have been recorded within the study area through the detection of scats, tracks, traces, camera trap detection or direct observation. Introduced fauna species includes:

1) the Cane Toad (*Rhinella marina*);
2) European Cattle (*Bos taurus*);
3) Wild Dog (*Canis famuiliaris*);
4) European Red Fox (*Vulpes vulpes*);
5) Red Deer (*Cervus elaphus*);
6) Feral Cat (*Felis catus*);
7) House Mouse (*Mus musculus*);
8) Rabbit (*Oryctolagus cuniculus*); and
9) Feral Pig (*Sus scrofa*).

Six of the introduced fauna species are restricted matters under the Biosecurity Act.

Mitigation and management measures are proposed to minimise impacts of the Project on terrestrial fauna, including:

- establishing vegetation clearing protocols;
- preparing a Clearance Management Program;
- conducting pre-clearing inspections to identify the presence or likely presence of animal breeding places for threatened or near-threatened species;
- revising the existing Lake Vermont Mine Pest and Weed Management Plan (where appropriate) and implementing it for the Project;
- developing and implementing a Species Management Program to provide for management of breeding areas for key conservation species potentially impacted by the Project;
- undertaking progressive rehabilitation (in accordance with the PRCP developed for the Project);
- undertaking drainage mitigation measures to reduce areas of ponding created by subsidence;
- preparing a Subsidence Management Plan that provides for monitoring, management and mitigation measures for potential subsidence impacts;
- implementing erosion and sediment controls (specifically relevant to avoiding impacts on habitat for the Ornamental Snake, Australian Painted Snipe and migratory species);
- continuing to implement dust control measures (consistent with the operation of the existing Lake Vermont Mine);
- implementing waste management measures to reduce the risk of the introduction of pollutants (specifically relevant to avoiding impacts on habitat for the Ornamental Snake, Australian Painted Snipe and migratory species), including an update to the existing Lake Vermont Mine Waste Management Plan;
- conducting lighting with particular regard to avoiding impacts on habitat for the Koala and Greater Glider;

- implementing management measures to reduce impacts on fauna species due to vehicle strikes, with particular regard to avoiding impacts on the Koala;
- implementing waste management measures to prevent the creation of conditions likely to favour pest species, with particular regard to pest species identified as potentially impacting the Squatter Pigeon, Australian Painted Snipe, Koala and migratory species; and
- preparing an Emergency Response Plan and implementing bushfire prevention measures (particularly relevant to avoiding impacts on the Squatter Pigeon, Koala, Greater Glider and migratory species).

ES.5.6.3 Aquatic ecology

Aquatic habitat of watercourses and wetlands within the Project area is generally fair to good. A total of 638 fish have been captured during field surveys, representing nine species from five families. A total of 344 crustaceans have been captured during field surveys, representing five species from four families. No listed 'endangered, vulnerable or near-threatened' (EVNT) species have been observed at any of the survey sites. All fish species recorded during surveys are considered common, or widespread, species in the Isaac River Sub-basin. No pest fish species have been observed during any of the surveys.

No turtle species listed under the EPBC Act or NC Act have been observed during the surveys, and no Least Concern turtle species were noted during the 2020 and 2021 surveys. A single Krefft's River Turtle (*Emydura macquarii krefftii*) was recorded upstream of the Project during the preliminary survey in 2019. The ephemeral nature of the watercourses limits the suitable habitat for turtle species listed under the EPBC Act or NC Act.

Taxonomic richness of macroinvertebrates is generally low to moderate. None of the sites sampled during surveys exhibited a taxonomic richness that met the upper Water Quality Objective (WQO), while nine samples met or exceeded the lower WQO. PET taxa richness is below the high WQO in samples from all sites collected (in both surveys) and is typically below the low WQO, which is representative of the habitats and the ephemeral nature of the watercourses within the study area. The weighted SIGNAL 2 scores recorded from the samples collected are generally low, ranging from 2.6 to 4.2 and generally fall within Quadrant 4 (site conditions likely influenced by urban industrial or agricultural pollution). The SIGNAL2 scores indicate poor habitat availability and environmental conditions, which is likely a result of the ephemeral nature of the watercourses within the study area.

Several wetlands of General Ecological Significance and High Ecological Significance have been mapped within the study area and surrounds. The Project will not result in a significant impact on prescribed wetlands.

No aquatic species of conservation significance are considered likely to occur within the study area.

Waterways that provide for fish passage under the *Fisheries Act 1994* are considered matters of state environmental significance. Of the waterways providing fish passage within the study area:

- The Isaac River is classified as a major risk of adverse impacts on fish movement.
- Philips Creek, Boomerang Creek and Hughes Creek are classified as major risks of adverse impacts on fish movement.
- One Mile Creek is classified as a high risk of adverse impacts on fish movement.
- One minor waterway is classified as a low risk of adverse impacts on fish movement (located on ML 70477).
- Ripstone Creek (to the north of the Project area) is classified a high risk of adverse impacts on fish movement.

The Subsidence Management Plan prepared for the Project will include monitoring, management and mitigation measures for potential subsidence impacts of the Project and, relevant to fish passage, will include mitigation measures to reprofile subsided channels if/as necessary. As such, the Project is unlikely to have a significant impact on waterways providing fish passage.

General management measures will be implemented to minimise disturbance to aquatic habitats and minimise changes to water quality, including:

- designing watercourse crossings to consider fish passage;
- designing flood levees to withstand anticipated increases in flood velocities;
- limiting direct impact on the identified disturbance areas;
- locating areas of disturbance outside watercourses and wetlands where possible; and
- reviewing and updating the following (existing) Lake Vermont Mine environmental management plans:
    - Erosion and Sediment Control Plan (being a sub-component of the Water Management Plan);
    - Water Management Plan;
    - Chemical and Fuel Management Plan;
    - Receiving Environment Monitoring Program; and
    - Waste Management Plan.

ES.5.6.4 Stygofauna

Stygofauna have been recorded at two sites along Boomerang Creek and stygophiles/stygozenes have been recorded at four sites along Boomerang Creek.

A low diversity of groundwater-dependent subterranean fauna are in the shallow, unconfined Tertiary/alluvial aquifers of the Boomerang Creek alluvium, close to the stream but not in the floodplain. Stygofauna are present within the groundwater drawdown zone of the Project and the groundwater flow path of any potential contamination event downstream of the development.

None of the subterranean fauna species recorded are currently listed as endemic, relictual, rare, endangered or threatened biota or are populations or communities listed under the NC Act or EPBC Act. The ecological value of the two bores in which subterranean fauna are detected is considered low due to the restricted nature of the habitat, inability of habitat to support broad subterranean fauna communities and the taxa collected are considered disturbance tolerant and present in very low numbers. The disjunct distribution of the fauna between the bores indicates a discontinuous connectivity between the shallow alluvial aquifers and Boomerang Creek. The risk of the proposed Project to these subterranean ecosystems is rated as low, based on the shallow modelled depth of drawdown within the Tertiary sediments compared to the depth of the aquifer and the limited potential water quality changes to Boomerang Creek.

Ongoing monitoring of groundwater levels and quality provides a means to monitor potential changes to the stygofauna community. This monitoring will be facilitated through the proposed updates to the Lake Vermont Mine Water Management Plan.

ES.5.6.5 Groundwater-dependent ecosystems

Two types of Groundwater-dependent ecosystems (GDEs) are present within the potential impact area of the Project:

- Type 1 GDEs—groundwater-dependent vegetation developed on drainage features and associated alluvial landforms along Boomerang Creek and Hughes Creek in the Project area (and Phillips Creek and Isaac River outside the Project area); and
- Type 2 GDEs—groundwater-dependent wetland vegetation developed on perched groundwater lenses, present to the east of the Project area (as a HES wetland).

GDEs present on alluvial landforms use groundwater seasonally recharged by surface flows and flooding. The GDEs on perched groundwater lenses use water recharged from percolating surface water captured at the alluvial unconformity. Neither GDE type uses water held in regional Tertiary aquifers or coal seams. The assessment of potential impacts to GDEs has concluded that there is no significant residual risk to the GDEs in the vicinity of the Project; however, ongoing monitoring is proposed.

Mitigation, management and monitoring measures proposed to minimise the risk of impacts to GDEs include:

- operating under an updated Lake Vermont Mine Water Management Plan, which has the primary objective of minimising environmental harm;
- conducting ongoing groundwater monitoring;
- updating the existing Lake Vermont Mine Receiving Environment Monitoring Plan to include additional sites to enable monitoring of potential impacts to GDEs within the influence of the Project; and
- developing a Groundwater Dependent Ecosystem Monitoring and Management Plan to provide for additional baseline data collection and monitoring of GDEs and protocols for adaptive management, should impacts to GDEs be identified as being resultant of Project activities.

ES.5.7 Biosecurity

Biosecurity risks of relevance to the Project include introduced species of fauna and flora, public health pests and agricultural pests.

Nine introduced fauna species have been recorded during the ecological surveys of the Project site. All of these introduced species are listed as either a prohibited matter, or restricted matter under the Biosecurity Act.

Thirty-five introduced flora species have been recorded during the ecology surveys of the Project site. Of the introduced species, seven are listed as restricted matters under the Biosecurity Act and five are Weeds of National Significance.

Rodents and mosquitos have the potential to act as vectors of disease and are present in the area. Leptospirosis, which is a notifiable disease under the Public Health Act, can be spread by rodents and has been recorded in the region previously. Several mosquito-borne notifiable diseases that can be transmitted to humans potentially occur in the area.

Mosquitos and ticks can also spread diseases and viruses to livestock. The Project is within the cattle tick-infested biosecurity zone where cattle ticks are endemic and will thrive if left unmanaged.

Mitigation and management measures have been proposed to minimise impacts on the Project from biosecurity matters, including:

- updating and implementing the Lake Vermont Pest and Weed Management Plan;
- storing waste and disposing of rubbish in appropriate receptacles to discourage scavenging;
- limiting soil disturbance as far as practicable; and
- monitoring and treating weed and pest infestations.

ES.5.8 Air quality

The existing Lake Vermont Mine and the existing Saraji Mine represent the main sources of anthropogenic dust in the local region. Several other surrounding coal mines have also been identified as potential contributors to ambient dust concentrations.

Potential air quality impacts have been assessed for the mining operations during Project Year 7 (indicatively 2032) and Project Year 22 (indicatively 2047). Project Year 7 is representative of a high production year for the proposed underground mine, while Project Year 22 represents a period of overlap between the proposed underground mine and the proposed open-cut pit mining operations. These years have been selected as indicative of worst-case impacts on air quality.

For both Year 7 and Year 22, the predicted Total Suspended Particulate concentrations (24-hour average concentrations of $PM_{2.5}$, annual average concentrations of $PM_{2.5}$ and annual average concentrations of PM_{10}) comply with the Queensland 'Environmental Protection (Air) Policy (2019)' objectives at all assessed Project sensitive receptors (in isolation and cumulatively) for the years assessed. Predicted maximum monthly dust deposition rates and 24-hour average concentrations of PM_{10} comply with the existing Lake Vermont EA limits at all assessed Project sensitive receptors in isolation and cumulatively.

The impact of particulates was assessed as the critical air pollutant for determining impacts, and achieving no impact from particulates is considered to be sufficient to manage potential impacts from other pollutants. Practices to mitigate air quality emissions are in place for the existing Lake Vermont Mine and will be continued for the duration of the Project. The proposed measures to mitigate air quality impacts are targeted to managing potential impacts from particulates and will also provide benefits to mitigate potential impacts from other pollutants. These mitigation measures include:

- application of water to haul roads;
- watering during handling activities;
- machine and vehicle maintenance;
- vegetation establishment on recontoured / rehabilitated areas;
- watering of stockpiles; and
- sealing of the ROM haul road from the Project to the existing CHPP.

Additional emissions controls will be proactively applied when necessary, typically during periods when meteorological conditions promote an increase in dust generation; for example:

- additional road watering concentrated at problem areas;
- speed restrictions imposed on haul trucks when dust is visible (reducing the overall hauling capacity by approximately 20%);
- re-routing haul trucks to reduce waste haulage distances by up to 50%; and
- re-assigning haulage location(s) to areas experiencing less dust.

The proposed mitigation measures are considered sufficient to manage potential air quality impacts to within the proposed limits. Restricting impacts to within the proposed limits will achieve the objectives of the Environmental Protection (Air) Policy and ensure compatibility of the Project activities with existing and potential land uses of the area which are low-intensity cattle grazing, mining and resource exploration.

Additional air quality control measures may be implemented, if and as required, following a complaint; for example:

- applying additional at-source dust air quality controls;
- increasing the intensity of air quality controls;
- modifying certain operations to reduce impacts to air quality; and
- investigating exceedances of air quality objectives.

In addition to implementing initiatives designed to mitigate, reduce, control or manage greenhouse gas emissions from the Project, Bowen Basin Coal will investigate preferred and alternative measures to contribute towards the Queensland Government emissions reduction and renewable energy targets by taking climate action measures advised by the Queensland Government recommended climate actions, including:

- assess and manage the exposure of the Project to climate change risks;
- investigate the development of a Project emissions reduction target;
- investigate renewable energy options;
- acquire carbon credits through carbon farming initiatives where practicable to offset Project carbon emissions; and
- investigate options for producing energy on-site from waste materials.

The predictive modelling shows that the Project air quality impacts are unlikely to exceed the proposed limits and are likely to achieve the objectives of the Environmental Protection (Air) Policy. The Project will be subject

to reporting obligations, in conjunction with Lake Vermont Mine. Where the Project exceeds the air quality limits or receives a complaint of nuisance at a sensitive place, targeted monitoring will be required to investigate potential impacts. The Project will be subject to annual monitoring and reporting of greenhouse gas emissions under requirements of the National Greenhouse and Energy Reporting scheme.

ES.5.9 Noise and vibration

The existing background noise surrounding the Project can be characterised as reasonably quiet, ambient noise levels predominately influenced by mine-related noise from nearby mining operations, natural sources (e.g. frogs, insects, birds, wind in trees) and farm-related sources (e.g. farm machinery, livestock, dogs).

A Noise and Vibration Assessment (Appendix M, Noise and Vibration Assessment, Sections 6 and 7) has been conducted to identify key sources of noise and vibration emissions from the construction and operational activities associated with the Project. Potential noise impacts have been modelled for Project Year 7 and Project Year 22. These scenarios have been selected to represent the years most likely to produce the most severe noise impacts (worst-case scenarios). Specifically, Project Year 7 (indicatively 2032) represents a high production year for the proposed underground mine, while Project Year 22 (indicatively 2047) represents a period of overlap between the proposed underground mine and the proposed open-cut pit mining operations. Predicted noise levels in Project Year 22 are comparatively higher than Project Year 7, primarily resultant of the proposed open-cut mining activity (which commences during Project Year 20). However, no exceedances of the proposed Project noise conditions are predicted at any sensitive receptors for either of the modelled years.

The Project blasting assessment predicts that ground vibration will not exceed the objective of 5 mm/s at distances greater than 1.5 km. The airblast overpressure assessment predicts that airblast levels will meet the Project objective of 115 dB(Z) at distances greater than 1.03 km, with airblast levels of 120 dB(Z) predicted at 700 m. Given all applicable SRs are greater than 10 km away from the Project's proposed open-cut pit blasting limits are anticipated to be complied with throughout all Project phases. A 'Blast Monitoring Program' is in operation for the existing Lake Vermont Mine, which will be extended to include the Project site.

In regard to cumulative noise and vibration impacts, it is acknowledged that the Project is close to several existing and proposed mining projects. The assessment of cumulative noise impacts, however, concluded that the Project is not expected to significantly contribute to cumulative impacts to sensitive receptors.

The assessment of Project noise impacts determined that noise impacts will not exceed the proposed noise criteria, and thereby achieve the performance outcome for the environmental objective for noise under Schedule 8 of the EP Regulation. By demonstrating that the Project can achieve the proposed noise criteria, the Project is compatible with current and future land uses which include mining and grazing.

Noise and vibration mitigation measures are not expected to be required for the Project to meet proposed compliance limits because of the relatively large distance to sensitive receptors and the low modelled noise and blasting outputs predicted. Noise and vibration exceedances and/or complaints are not reasonably expected as a result of the proposed Project. However, should the Project receive a noise or blasting-related complaint, the Project operator will:

- undertake an investigation to verify and understand the matter of concern, including undertaking monitoring from the relevant noise-sensitive place (consistent with the conditions of the existing Lake Vermont Mine EA and the 'Model Mining Conditions' [DES 2017c]); and
- prepare a report if an exceedance of a noise or blasting limit is identified that includes monitoring results obtained, assessment of any mitigating and/or aggravating factors and proposed suitable mitigation measures to return the Project to compliance.

In the event of a noise or vibration related complain, short-term monitoring will be undertaken. Should continuous/ongoing complaints originating at the same sensitive residential or commercial place arise, longer-term noise monitoring will be implemented to ensure that an exceedance of noise limits can be identified immediately. Should monitoring confirm that noise criteria are not being met with the current management actions, corrective actions will be undertaken. A range of noise management strategies will be considered, and

an approach designed to best mitigate the recorded exceedances will be applied. The range of measures that may be considered includes:

- reducing or stopping operations during times that are likely to result in exceedances;
- moving mine equipment further from sensitive receptors;
- reducing the amount of mine equipment in use at any one time;
- incorporating noise mitigation equipment;
- engineered noise reduction features; and
- providing acoustic or ventilation upgrades to sensitive receptors.

ES.5.10Waste management

The types of waste expected to be generated by the Project during the construction, operational and decommissioning phases include:

- non-mineral waste (general waste);
- mineral waste (mining waste); and
- mine-affected wastewater.

Non-mineral waste generated by the Project will include:

- regulated waste (as defined by the EP Regulation);
- general waste;
- recyclable waste;
- re-usable/refurbishable items;
- used tyres;
- cleared vegetation;
- primary treated sewage effluent;
- secondary treated sewage effluent; and
- Class C effluent for irrigation.

Regulated wastes, including waste oils, oil filters, waste grease, paints, various hydrocarbon contaminated materials and sludge resulting from the treatment of sewage and water, will be collected and stored within the Project waste collection facilities, and batch disposed of to various specialist waste treatment, recycling or disposal facilities in accordance with the properties of the specific materials. Regulated wastes will be stored in fuel/chemical storage areas with adequate bunding and in areas equipped for immediate clean-up of spills. Sewage and water treatment sludge will be generated by the sewage and water treatment systems in quantities suitable to be transported off-site for disposal. The sewage and water treatment sludge will be stored in the treatment facilities until collection a licensed contractor and disposed of at a licensed facility.

Non-recyclable general waste produced by the Project will be disposed of in a residual void at the existing Lake Vermont Mine, in accordance with existing approvals.

Recyclable waste will be recycled at the Dysart or Moranbah Waste Management Facilities.

Class C effluent will be used for on-site irrigation.

Mineral waste produced by the Project will comprise waste rock material (spoil) and coal reject material (coarse reject and tailing). Waste rock geochemical characteristics indicate a very low presence of sulphur, with negligible capacity to produce acid drainage. Project waste rock is also expected to generate low salinity runoff

or seepage due to its low salinity characteristics. Metal or metalloid concentrations of Project waste rock is not enriched relative to guideline values or median values for unmineralised soils. As such, management of waste rock material is considered to present a low risk of environmental harm. Coal and reject material have neutral to slightly alkaline pH values, with low salinity leachate values, low median sulphur content (0.1%), negligible capacity to generate acidity, and low metal and metalloid concentrations. Coal waste geochemical characteristics of the Project materials are, therefore, considered to be of low risk to the environment.

Waste rock from the construction of the drift will be used in Project construction activities. Waste rock from the open-cut operation will initially be placed in two waste rock emplacements adjacent to the mine pit or placed in the pit behind the advancing operations. Progressive rehabilitation will be undertaken as the waste rock emplacements are no longer required for mining operations. No coal rejects will be disposed of within the Project area, with all rejects to be handled within existing Lake Vermont Mine infrastructure.

Mine-affected wastewater will be generated through the runoff of surface water over disturbed areas, and dewatering of the underground mine. No mine-affected water releases to the receiving environment are proposed. Mine-affected water in excess to site operational needs will be pumped to the Lake Vermont Mine for use and management.

The existing Lake Vermont Mine has demonstrated a capability to manage the environmental impacts associated with both mineral and non-mineral waste materials. Central to this is the operation of a Waste Management Plan and a Mine Waste Management Plan. These existing plans will be updated to include consideration of management activities associated with the Project's waste management processes.

ES.5.11Hazards and safety

A preliminary risk assessment workshop has been undertaken to analyse and evaluate risks and hazards. Of the 60 unique risks identified and assessed, Class IV (very high) risks have not been identified, while six Class III (high) risks have been identified. It should be noted that a number of Class II risks are so ranked by virtue of a potential fatality to an employee or as a consequence of a necessary disturbance to be authorised by the EA if approval is granted.

The identified Class III risks are summarised in Table ES. 1, along with additional control measures to be utilised to further minimise these risks.

Table ES. 1: Identified Class III risks and additional control measures

Risk or hazard	**Risk mitigation approach**
Safety: Increased risk of motor vehicle incidents	• Fatigue management/fitness for work • Alcohol and drug testing • Road safety awareness training
Operational OHS hazards	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	• Employee training • Supervision • Critical controls relating to blast management
Land disturbance: Direct clearing, topsoil removal and earthworks	• Sediment dams • ESC controls • Rapid revegetation
Air quality: Dust impacts to sensitive receptors	• Chemical treatment of haul roads • Rescheduling of blasting operations • Reactive dust control measures
Impacts on fauna (wildlife interactions)	• Monitor fauna interactions *via* incident reporting • If required, introduce additional controls (e.g. fencing, ultrasonic deterrent devices etc.)

The existing Lake Vermont Emergency Response Plan will be updated to provide risk mitigation and emergency response protocols for the proposed Project, and will be applicable to all Project phases. The Emergency Response Plan includes a Bushfire Management Plan section to address the emergency response to fires. This will be updated prior to Project commencement and will identify specific bushfire hazards for the Project area, as well as outline the response and resourcing required for bushfire emergencies.

ES.5.12Cultural heritage

ES.5.12.1 Indigenous cultural heritage

The recognised Traditional Owners of the area encompassed by the Project site are the Barada Barna People (formerly known as the Barada Barna Kabalbara and Yetimarla People), represented by the Barada Barna Aboriginal Corporation. The Project area is within the Barada Barna People's Native Title application area, per determination reference QCD2016/007, which was registered with the 'National Native Title Tribunal' on 31 August 2016. Native title has been extinguished over all land within the Project area and does not form part of the 'Barada Barna People's Native Title Determination Area'.

Relevant to sections 86 and 87 of the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act), it is acknowledged that Bowen Basin Coal entered into a Cultural Heritage Management Plan (CHMP) with the Barada Barna Kabalbara and Yetimarla People on 5 March 2007. The CHMP continues to apply and extends across all Bowen Basin Coal tenements relevant to the Lake Vermont Mine (inclusive of the Project site).

Consistent with the operations of the CHMP, Bowen Basin Coal has undertaken cultural heritage survey work across the entirety of the Project area. As a result of completed survey works, unconditional cultural heritage clearance has been provided for the entirety of the Project site. Bowen Basin Coal has a commitment (within the CHMP) to engage the Barada Barna People on the salvage of any potentially impacted scar trees and other artefacts that may be identified prior to commencing any planned ground disturbance activities.

Additionally, to support an understanding of Indigenous cultural heritage and the values and commitments of the CHMP, Bowen Basin Coal will provide suitable induction material for all Project personnel.

ES.5.12.2 Non-Indigenous cultural heritage

The cultural landscape of the Project area reflects the history of the pastoral activities in the region. Eight sites were identified as potentially having non-Indigenous cultural heritage significance. However, no sites are considered to meet the threshold criteria for local heritage significance. These eight sites are considered common for this area and appear to have been constructed relatively recently.

There is low potential for further historic and archaeological items/places to exist within the Project area. As such, due diligence will be provided during construction and operational activities to ensure any new finds can be adequately considered. In addition, site induction material prepared for Project personnel will include information on the potential occurrence of non-Indigenous cultural heritage sites and the actions that are to be taken if a potential site or item is found.

ES.5.13Social environment

Potential impacts of the Project on the social values of local and regional communities have been identified through undertaking a Social Impact Assessment (Appendix P, Social Impact Assessment, Section 2.4).

Potential social impacts and benefits of the Project on workforce management include increased labour force participation, including work opportunities for young people and retention of existing Dysart residents employed at Lake Vermont Mine. The Project also has the potential to exacerbate local and regional skills shortage and increase personal and family stress due to fatigue and travel requirements; however, these risks are considered to be of low significance.

Potential impacts on housing and accommodation include increased demand for quality housing and short-term accommodation and increased returns for property owners in Dysart. The potential negative impacts identified are temporary increases in rental prices and reduced housing availability; however, these risks are considered to be of low significance from the proposed Project, which represents a continuation of an existing operation.

Potential impacts on local business and industry include increased patronage of local business and enhanced economic benefit indirectly leading to potential generation of further employment opportunities and enhanced overall productivity in regions.

Potential impacts on health and community wellbeing include population retention in Dysart and an associated increase in social capital and an increase in overall socio-economic wellbeing through provision of community investment initiatives.

An increase in the non-resident population of Dysart has the potential to decrease community cohesion with an associated risk of anti-social behaviour. The Project also has the potential to increase demand for local services, such as emergency services, healthcare and childcare, reducing the level of service for existing residents. Relinquishment of Native Title due to expansion of the Lake Vermont Accommodation Village has also been considered as a potential impact.

The Project Social Impact Management Plan identifies mitigation and management measures across five key sub-plan areas, namely:

1) Community and stakeholder engagement—to facilitate stakeholder engagement, consultation and collaboration.

2) Workforce management—to maximise recruitment of and training opportunities for residents from local and regional communities and support the safety, health and wellbeing of the workforce and their families.

3) Housing and accommodation—to provide choice regarding accommodation, minimise negative effects of local housing affordability and availability, and ensure provision of accommodation to non-resident workers, which does not place an excessive burden on existing infrastructure, facilities and services used by local and regional communities.

4) Local business and industry procurement—to maximise opportunities and reduce barriers for local businesses to provide goods and services to the Lake Vermont Meadowbrook Complex and to ensure that the objectives and strategies of the 'Local Business and Industry Procurement Plan' are reflected in the structuring of contracts for employees and contractors.

5) Health and community wellbeing—to minimise adverse social impacts to existing Dysart residents and enhance community cohesion and contribute to the community through supporting local communities' activities.

In respect of mitigation and management measures proposed, the Project is not anticipated to have a significant impact on the existing or future social environment of the Project region.

ES.5.14Economic environment

The Project will contribute to economic growth through increased industry output and Gross Regional Product (GRP) during construction and operation, flowing from both direct and indirect impacts. At peak operations, the Project is expected to support an additional $315.7 million in GRP, compared to what would otherwise occur if the Project does not proceed.

The Project will support additional employment and household incomes during construction and operation, compared to what would occur without the Project. Including both direct and flow-on (supply chain) impacts, the Project is estimated to support an additional:

- 1,044 FTE job years (in total) during construction;

- 289 FTE job years (in total) that will be maintained through capital replacement activities between 2031/32 and 2044/45; and
- 414 FTE jobs per annum on average during peak mining activity between 2027/28 and 2027/48.

The Project will support demand for goods and services for a number of businesses within the Catchment, including local worker accommodation villages, businesses within the construction and mining supply chains, as well as providers of export infrastructure. In total, Catchment construction businesses and the supply chain are estimated to receive revenue of approximately $361.9 million through construction phase activities and capital replacement activities estimated to generate business revenues of $83.4 million, while mining supply chain businesses in the Catchment are estimated to receive an additional $8.4 million in business revenue per annum during peak operations that would not occur without the Project, providing additional security and longevity of business incomes.

Overall, the Project is estimated to deliver an annual average of:

- $1,919.4 million in additional revenue to the Australian Government, through personal income tax, fringe benefits tax, company tax, and Goods and Services Tax (GST), compared to what would occur without the Project.
- $1,334.5 million in additional revenue to the Queensland Government, primarily through royalty payments, compared to what would occur without the Project,

Potential adverse economic impacts from the Project, including cumulative impacts on agricultural production, local businesses (from competition for resources), local property values, industry (from exchange rates), and economic resources have been assessed as low to very low.

ES.5.15Transport

Road and rail transportation are expected to be the primary modes of transport associated with Project activities. Material and equipment will be transported by road between locations in Queensland (Mackay, Rockhampton *via* Mackay, Moranbah and Dysart) and the Project site. Raw water will be piped to the Project site *via* the proposed infrastructure corridor. Personnel will be transported by road between the mine accommodation village in Dysart and the Project site. Product coal will be transported by rail from the Lake Vermont Mine loading facility to seaport coal terminals where it will be shipped to overseas customers. The Project will extend the period over which the existing Lake Vermont Mine operation will be able to maintain production at 9Mtpa; consequently, the existing coal transport arrangements by rail and sea will be maintained.

The principal road network components relevant to the Project are:

- Peak Downs Highway;
- Peak Downs Mine Road;
- Saraji Road;
- Queen Elizabeth Drive;
- Dysart Bypass Road;
- Golden Mile Road;
- Lake Vermont Mine Access Road; and
- Fitzroy Development Road.

Being an existing operation that is seeking to maintain existing levels of production, traffic impacts resultant of the proposed Project are considered to be minimal. Minor increases in traffic volumes will primarily be associated with the 2-year construction phase of the Project. No impacts above the 5% standard axle repetition threshold have been identified for the State-Controlled Road network for any Project Year, and therefore, it is considered that no contributions to offset pavement impacts are required.

Pavement impacts to the council-controlled Golden Mile Road west of the site access road are anticipated to be approximately 3.8% above the baseline standard axle repetition in Project Year -1 (Project construction phase) reducing to 1.3% by Project Year 3. An impact of less than 1% above the threshold is expected east of the site access road. Pavement impacts to council-controlled roads are, therefore, minimal. All other council-controlled road sections and Project years are not expected to experience pavement impacts exceeding standard axle repetitions of 5%.

All intersections assessed for the Project have been identified to exceed the required turn treatments for the expected traffic travelling through intersections. No intersection upgrades are therefore required to accommodate Project generated traffic.

Potential impacts of the Project on road transport can be avoided through the application of the following mitigation measures:

- monitoring workforce hours and driver behaviours through the completion of Job Safety Analyses;
- implementing Safe Operation of Mobile Plant Standard Operating Procedures, Journey Management Systems and a Fatigue Management Policy;
- educating the workforce through inductions on road safety; and
- ensuring that the transport of hazardous and dangerous goods complies with the Australian Dangerous Goods Code.

No specific rail, sea or air transport mitigation measures are proposed to be implemented for the Project.

ES.6 General environmental management commitments

The proposed environmental management commitments will be achieved through proposed amendments to EA conditions of the Lake Vermont Mine. An application to amend the existing EA with the proposed changes will be made at the completion of the EIS assessment. Key environmental management measures to be implemented for the Project include:

- designing a Project site that reduces the impacts of climate change risks on the Project, subsequent land uses and surrounding land uses;
- progressive rehabilitation of the Project site to result in a final landform that is safe, stable, non-polluting and able to sustain the approved post-mining land use;
- construction of temporary flood protection levees to provide 0.1% AEP flood immunity to the Project MIA and open-cut operation, and shaping of the final landform surrounding the rehabilitated pit to protect the depression from surface water ingress for 0.1% AEP flood events;
- operation of a Project water management system to sustain local and regional water resources and water quality values;
- implementing practices to manage biosecurity risks to people, livestock and the environment;
- managing waste in accordance with the waste management hierarchy;
- constructing and operating the Project in a manner that protects cultural heritage values;
- undertaking ongoing community and stakeholder engagement throughout the construction, operation and decommissioning phases of the Project;
- biodiversity offsets for significant residual impacts to identified MNES and MSES; and
- operating proactive and reactive air quality monitoring and management measures to ensure compliance is met at sensitive receptors.

Further to the above, Bowen Basin Coal has committed to the preparation and implementation of the following plans, programs and strategies to minimise impacts to environmental values:

- Progressive Rehabilitation and Closure Plan (provided as Appendix B of this EIS);
- MNES Biodiversity Offset Strategy (provided as Appendix K of this EIS);
- Subsidence Management Plan;
- Land Disturbance Permit System;
- Gas Management Plan
- Topsoil Management Plan;
- Rehabilitation Monitoring Program;
- Water Management Plan;
- Erosion and Sediment Control Plan (as a component of the Water Management Plan);
- Groundwater Monitoring and Management Plan (as a component of the Water Management Plan);
- Receiving Environment Monitoring Plan;
- Mine Pest and Weed Management Plan;
- Clearing Management Program;
- Species Management Plan;
- Groundwater Dependent Ecosystem Monitoring and Management Plan;
- Waste Management Plan;
- Mine Waste Management Plan;
- Blast Monitoring Program;
- Safety and Health Management System;
- Emergency Response Plan (incorporating a Bushfire Management Plan);
- Cultural Heritage Management Plan;
- Social Impact Management Plan, incorporating:
    - Workforce Management Plan;
    - Housing and Accommodation Plan;
    - Local Business and Industry Procurement Plan;
    - Health and Community Wellbeing Plan; and
    - Community and Stakeholder Engagement Plan;
- Workforce Code of Conduct;
- Job Safety Analyses;
- Safe Operation of Mobile Plant Standard Operating Procedure;
- Journey Management Systems;
- Fatigue Management Policy; and
- Road safety inductions.

Proposed mitigation and management measures are designed to ensure the proposed continuation of the existing Lake Vermont Mine can be undertaken sustainably, while also providing significant benefits to local and regional communities.