Jellinbah Group

LAKE VERMONT RESOURCES ENVIRONMENTAL IMPACT STATEMENT

CHAPTER 6 REHABILITATION

arc ENVIRONMENTAL SOLUTIONS

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6 Rehabilitation

This chapter outlines key factors relevant to rehabilitation and closure for the Project and describes the approach to rehabilitation and closure to be taken by the Proponent. It draws on input from other EIS chapters, in particular:

- Chapter 5, Land Resources;
- Chapter 10, Terrestrial Ecology;
- Chapter 15, Waste Management;
- the Progressive Rehabilitation and Closure Plan (Appendix B); and
- various other related technical studies included as appendices to this EIS.

6.1 Relevant policy and legislation

6.1.1 Progressive rehabilitation

In Queensland, mine rehabilitation is required under the EP Act. This chapter has been prepared to assist the DES in carrying out the environmental objective assessment in respect of the environmental objective for land in Part 3 of Schedule 8 of the EP Regulation (that is, the activity protects the environmental values of land) by achieving the following relevant performance outcomes:

- Activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land.
- Areas disturbed will be rehabilitated or restored to achieve sites that are safe and stable, where no environmental harm is being caused by anything on or in the land, and that are able to sustain an appropriate land use after rehabilitation or restoration.

Amendments to the EP Act in late 2018 implemented key elements of the State Government's 'Mined land rehabilitation policy' (DEHP *et al.*, n.d.), which ensures that land disturbed by mining activities is progressively rehabilitated to a safe and stable landform that does not cause environmental harm and is able to sustain an approved post-mining land use.

As a requirement of these amendments, a proposed PRCP for the Project must be prepared that complies with Division 3, Part 2 of Chapter 5 of the EP Act. The PRCP will apply for the life of the Project and has the following requirements:

- Outline each proposed post-mining land use (PMLU) and, where applicable and approved, any non-use management area (NUMA) for the Project site.
- Include a PRCP schedule of binding rehabilitation milestones for each PMLU and, where applicable and approved, any NUMA management milestones, including dates for completion of each milestone and criteria to demonstrate achievement of the milestones. The PRCP schedule must provide for the completion of rehabilitation or management milestones as soon as practical after the land becomes 'available for rehabilitation'.
- Detail and justify the rehabilitation methods and techniques to achieve the rehabilitation and management milestones.
- Detail the consultation undertaken with the community when preparing the PRCP as well as the ongoing consultation in relation to the rehabilitation to be carried out.
- Include various management plans in relation to water and waste management, revegetation, mine closure and rehabilitation monitoring.

DES will assess and decide whether to approve the PRCP. If it is approved, the Proponent will be required to implement the PRCP and meet the rehabilitation milestones set out in the PRCP schedule, and DES will be empowered to enforce the rehabilitation milestones.

This chapter, along with related supporting chapters and technical studies, has been prepared in contemplation of the requirements of the EP Act, the PRCP Guideline (DES 2021a) and other relevant guidelines and best practice approaches to rehabilitation, and it demonstrates that the relevant performance outcomes for land rehabilitation will be met.

6.1.2 Financial provisioning

At the time an EA is issued for the Project, the estimated cost to rehabilitate and restore the environment in relation to the resource activities under the EA will be calculated, and an application will have been made to DES for a decision on the estimated rehabilitation cost in accordance with section 298 of the EP Act. As per section 297 of the EP Act, it will be a condition of the EA that the Proponent must not carry out a resource activity unless an estimated rehabilitation cost decision is in effect and the Proponent has made the relevant contribution to the financial provisioning scheme, which will secure the Proponent's rehabilitation obligations.

6.2 Key influencing ecosystem processes and functions

6.2.1 Topography, hydrology and climate

Ground elevations to the west of the Project area marginally higher in elevation than in the east, with the Project area generally draining west to east towards the Isaac River. The surface between Phillips Creek and Boomerang Creek is a broad, flat floodplain that slopes gently to the east from approximately 180 mAHD in the west to approximately 170 mAHD in the east. The Isaac River is the main watercourse in the Project surrounds and flows in a north-west to south-east direction to the east of the Project boundary.

The Project area is traversed by watercourses that flow in an easterly direction to the Isaac River. Hughes Creek (a fourth order stream), Boomerang Creek (a fifth order stream) and One Mile Creek (a third order stream) flow into the Project area from the west and south-west through the neighbouring BMA leases (Saraji Mine, Saraji East Project). The confluence of Hughes Creek with Boomerang Creek occurs in the west of the Project area, with One Mile Creek flowing into Boomerang Creek in the east of the Project area. These streams are defined as watercourses under the *Water Act 2000* (Qld) and all drain into the Isaac River and east to the Coral Sea *via* the Mackenzie River and Fitzroy River.

The climate characteristics of the Project area of relevance to rehabilitation outcomes can be summarised as follows:

- The wet season typically occurs between November and March and typically coincides with the hotter summer months.
- The dry season typically occurs between April and October, with monthly rainfall totals generally less than 25 mm.
- The average evaporation rates are approximately three times higher than the average annual rainfall.

Rehabilitation methods, particularly surface preparation activities, revegetation species selection, revegetation timing and rehabilitation maintenance activities, need to be sufficiently robust to address the climatic challenges that exist in this region.

6.2.2 Waste rock and coal reject geochemistry

The Project will generate approximately 186 Mbcm of waste rock material and 17.7 Mt of coal rejects from the CHPP. Geochemical assessment of the mining waste materials that will be produced by the Project is provided

in Appendix D, Geochemical Assessment. Overburden, interburden, roof, floor and parting materials have all been analysed as part of the geochemical assessment (Appendix D).

6.2.2.1 Waste Rock

Sulphur is a central element of any waste characterisation, with the oxidation of sulphidic mine wastes (such as waste rock and coal reject material) presenting a risk of releasing acid mine drainage (also known as acid rock drainage) to the receiving environment. The median content of sulphur from the analysis of Project material was 0.01%, which is lower than the background median crustal abundance in unmineralised soils (0.07% sulphur). Materials containing less than 0.1% sulphur are generally considered to be barren of sulphur. The majority of sulphur present in the Project material analysed was also in non-sulphide form (i.e. having negligible capacity to generate acidity).

Waste rock materials analysed have excess acid neutralising capacity (ANC) and are classified as non-acid forming (NAF), with a negative median net acid producing potential (NAPP) value of -41.2 kg H_2SO_4/t (sulphuric acid per tonne). Waste rock is expected to generate slightly alkaline to alkaline and low-salinity runoff and/or seepage with low-salinity characteristics. Metal or metalloid concentrations of Project waste rock are not enriched relative to guideline values or median values for unmineralised soils. Metals and metalloids have low solubility at the pH of leachate expected from bulk NAF waste rock, and dissolved metal concentrations in surface runoff are expected to be low and unlikely to pose significant risk to the quality of surface waters and groundwaters. Interburden and overburden materials are sodic and may be susceptible to dispersion and erosion.

Given that waste rock materials are NAF and pose negligible risk of acid mine drainage, no specific mitigation measures are required to support the PMLUs proposed for the rehabilitated in-pit and out-of-pit waste rock emplacement areas. The dispersive characteristics of the interburden and overburden materials have potential to be improved with the addition of gypsum and the use of topsoil spread to the recommended depth, which will further assist in revegetating and stabilising slopes.

6.2.2.2 Coal reject

Coal and coal reject materials have been determined to have neutral to slightly alkaline pH values with low-salinity leachate values. The median sulphur content of coal and coal reject material is 0.1%. The majority of coal samples contained sulphur in non-sulphide form; however, three of the 53 samples exhibited a sulphide proportion greater than 0.5%. Project coal and coal reject material are, therefore, considered to have negligible capacity to generate acidity with a negative median NAPP value of –19.7 kg H_2SO_4/t recorded. It is noted that all samples analysed had a negative NAPP. Metal and metalloid concentrations in Project coal and coal reject materials were also low, being below the National Environmental Protection Measure (NEPC 2013) guideline values, with the exception of molybdenum in one sample. Coal waste geochemical characteristics of Project materials are, therefore, considered to present a low-risk of environmental harm.

6.2.3 Topsoil resources

SMUs are described in Chapter 5, Land Resources. Topsoils in the Project area are generally suitable as seed surface material or root zone material, although some topsoils have been identified as having alkaline pH and are likely to require fertiliser to compensate for high pH and nitrogen deficiency. Soil fertility in the Project area is generally poor to moderate, with soils typically having moderate cation exchange capacity and low concentrations of several essential nutrients, such as nitrogen and phosphorous. The majority of stripped topsoil will originate from the Knockane and Norwich SMUs, which support grazing land suitability Class 3. However, these soils have been assessed as having weak structure and/or dispersive properties, particularly in the subsoils.

Based on the stripping depths recommended in Appendix C, Soil and Land Suitability Assessment (Section 9), the maximum volume of topsoil available for use in rehabilitation activities is 1,619,990 m^3 (Table 6.1). Based on a minimum recommended topsoil depth of 0.2 m, a topsoil volume of approximately 1,462,800 m^3 will be required for rehabilitation efforts over the life of the Project. The soil balance indicates that sufficient topsoil material will be available for rehabilitation. Measures to manage topsoil are described in section 6.4.1.

It should be noted that it is expected that topsoil will not be required in subsidence-impacted areas except in those areas cleared for the construction of gas drainage wells and associated access tracks. In these areas, topsoil will be stripped and stockpiled or windrowed at the site of disturbance for use in subsequent rehabilitation.

Table 6.1: Predicted topsoil volumes available for rehabilitation

SMU	Topsoil Stripping Depth (m)	Area likely to be disturbed under open cut disturbance area (ha)	Area likely to be disturbed under MIA (incl. vent shafts and substation) (ha)	Area likely to be disturbed under infrastructure corridor and access roads (ha)	Total topsoil volume available (m3)
Booroondarra	0.00–0.30	0.0	0.0	10.2	**30,660**
Knockane	0.00–0.20	513.7	67.4	32.9	**1,227,980**
Mayfair	0.00–0.25	0.0	0.0	14.5	**36,250**
Moreton	0.00–0.50	0.0	0.9	0.9	**8,900**
Norwich	0.00–0.20	149.2	0.0	7.1	**312,720**
Parrot	0.00–0.60	0.2	0.0	0.4	**3,480**
Total		**663.1**	**68.3**	**66.0**	**1,619,990**

6.2.4 Current land use and land suitability

The current land use of the Project site is low-intensity cattle grazing. Existing vegetation is a combination of introduced pasture, natural bushland and regrowth native bushland. Queensland Land Use Mapping (DES 2020b) classifies the Project area as 'grazing native vegetation', which is defined as (ABARES 2016):

> *Land uses based on grazing domestic stock on native vegetation where there has been limited or no deliberate attempt at pasture modification.*

This description is consistent with the vegetation communities associated with remnant or high-value regrowth vegetation, located predominantly in the north of the Project site and in the riparian corridors of Hughes Creek, Boomerang Creek and One Mile Creek. These vegetation communities represent four major habitat types, namely:

1) Brigalow Woodland;
2) Eucalypt Woodland;
3) Riparian Woodland; and
4) Vegetation Associated with Wetlands.

These areas are currently used for cattle grazing and are subject to grazing-related disturbances.

The remainder of land within the Project area can be more accurately described as 'Grazing Modified Pastures', which is defined as (ABARES 2016):

Pasture and forage production, both annual and perennial, based on significant active modification or replacement of the initial vegetation.

The current land use for the Project area is shown in Figure 6.1.

The built infrastructure in the local area includes:

- stock fencing;
- unsealed access tracks;
- stock watering dams;
- roads;
- power transmission lines;
- pipelines; and
- coal mining operation infrastructure.

A full description of existing land values is provided in Chapter 5, Land Resources.

Existing land use suitability for grazing within the Project area is defined as Class 3, agricultural land suitability (suitable land with moderate limitations) through to Class 4, agricultural land suitability (marginal land with severe limitations). However, land assessed as Class 4 is considered suitable for grazing based on the current land use of low-intensity grazing (Appendix C, Soils and Land Assessment, Section 6). Surface disturbance associated with the mine infrastructure areas and open-cut operation is predominantly restricted to areas classified as Class 3.

6.3 Rehabilitation planning

6.3.1 Rehabilitation objectives

In Queensland, mine rehabilitation is required under the EP Act. Amendments to the EP Act in late 2018 implemented key elements of the State Government's 'Mined Land Rehabilitation Policy' (Queensland Government 2018) to ensure that, for land disturbed by mining activities:

5) the land is safe and structurally stable;

6) there is no environmental harm being caused by anything on or in the land; and

7) the land can sustain a PMLU (section 111A of the EP Act).

These three objectives are the general rehabilitation goals for all areas disturbed by mining in Queensland.

6.3.2 Post-mining land use

The proposed PMLUs have been developed with consideration for the existing local and regional land uses, the 'Isaac Regional Planning Scheme' (Isaac Regional Council 2021), local ecological values and site characteristics (refer section 6.2.4). The aim of the PMLUs proposed is to reinstate the existing land use of low intensity cattle grazing by returning the land to similar vegetation types and land class suitability to that existing prior to mine disturbance. A beneficial environmental outcome will also be delivered by reinstating, as far as practicable, existing native vegetation communities. The proposed PMLUs outlined in Table 6.2 and Figure 6.2:

- are considered viable, having regard to the use of land in the surrounding region;
- are consistent with how the land was used before a mining activity was carried out; and
- will deliver, or aim to deliver, a beneficial environmental outcome.

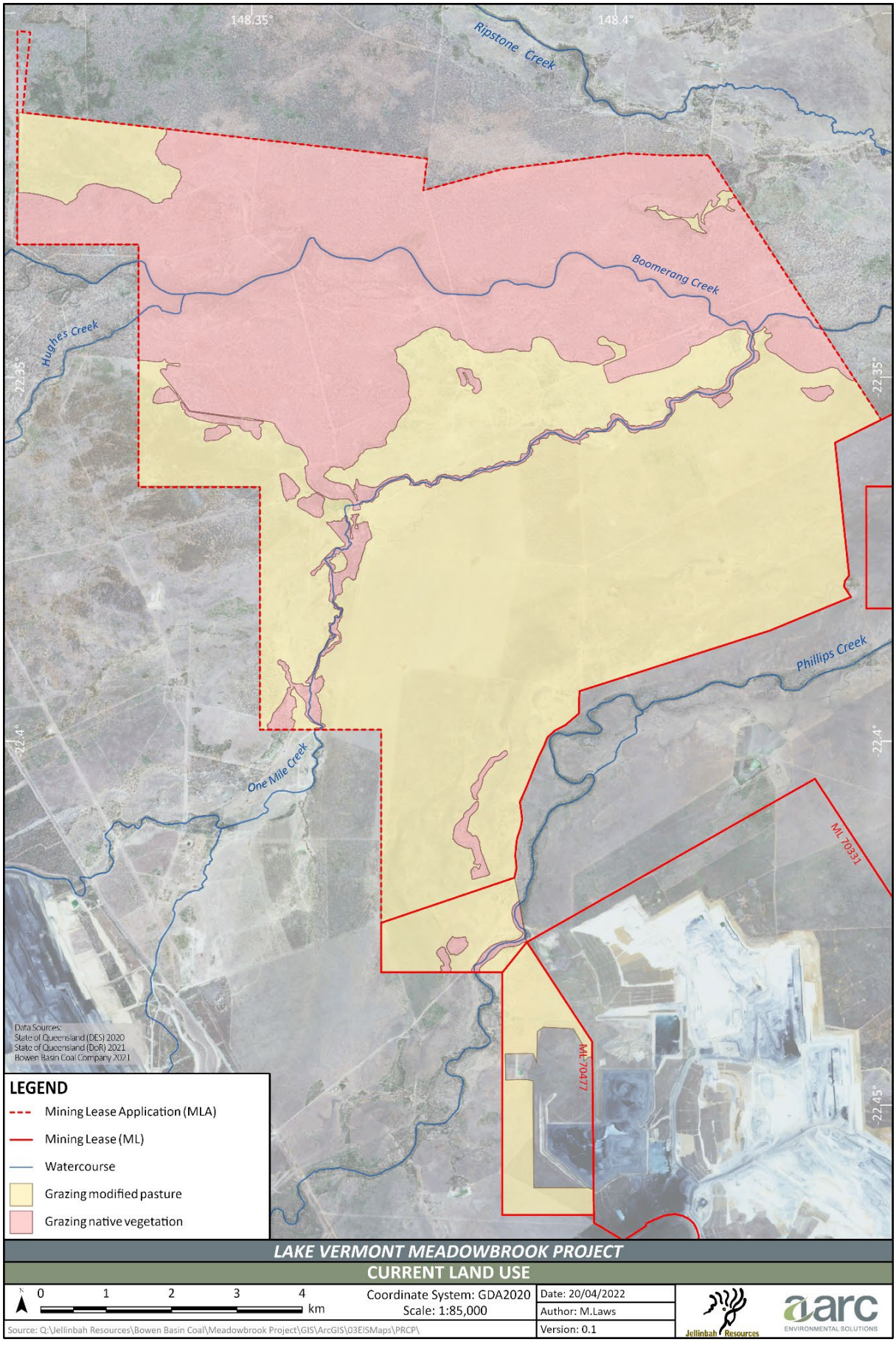

Figure 6.1: Current land use of Project area

Table 6.2: Post mining land use outcomes

Disturbance type		Rehabilitation areas	Pre-mining land use	Post-mining land use	Post-mining land description	Post-mining land suitability (grazing)
Mine infrastructure areas	Surface disturbance associated with mine infrastructure areas, including the MIA flood levee	RA1	Low-intensity cattle grazing	Marginal grazing modified pasture	Low-intensity cattle grazing	Class 4
Water management infrastructure	Dams and diversion drains (rehabilitated to pasture)	RA2a		Marginal grazing modified pasture	Low-intensity cattle grazing	Class 4
	Dams (retained for stock watering)	RA2b		Water body (stock watering and native ecosystem)	Dams to remain as water body	N/A
infrastructure corridor and access roads	Infrastructure corridor and access roads	RA3		Retained infrastructure	Retained infrastructure	N/A
Open-cut disturbance area	Open-cut disturbance area, including in-pit and out-of-pit waste rock emplacements and flood levee (slopes >10%)	RA4		Marginal grazing modified pasture	Pasture typically on slopes with limited grazing potential (>10%)	Class 4
	Open-cut disturbance area, including in-pit and out-of-pit waste rock emplacements and flood levee (slopes <10%)	RA5		Grazing modified pasture	Low-intensity cattle grazing (slopes <10%)	Class 3

Disturbance type		Rehabilitation areas	Pre-mining land use	Post-mining land use	Post-mining land description	Post-mining land suitability (grazing)
Areas subject to subsidence	Grazing native vegetation subject to subsidence and some surface disturbance associated with gas drainage bores and access tracks (Class 4 grazing land suitability)	RA6		Marginal grazing native vegetation	Low-intensity cattle grazing of native vegetation	Class 4
	Pasture subject to subsidence and some surface disturbance associated with gas drainage bores and access tracks (class 3 grazing land suitability)	RA7		Grazing modified pasture	Low-intensity cattle grazing	Class 3
	Pasture subject to subsidence and some surface disturbance associated with gas drainage bores and access tracks (class 4 grazing land suitability)	RA8		Marginal grazing modified pasture	Low-intensity grazing of pasture typically limited by soil characteristics	Class 4
	Grazing native vegetation on Boomerang Creek riparian zone subject to subsidence	RA9		Marginal grazing native riparian vegetation	Low-intensity cattle grazing of native vegetation in riparian zone	Class 4

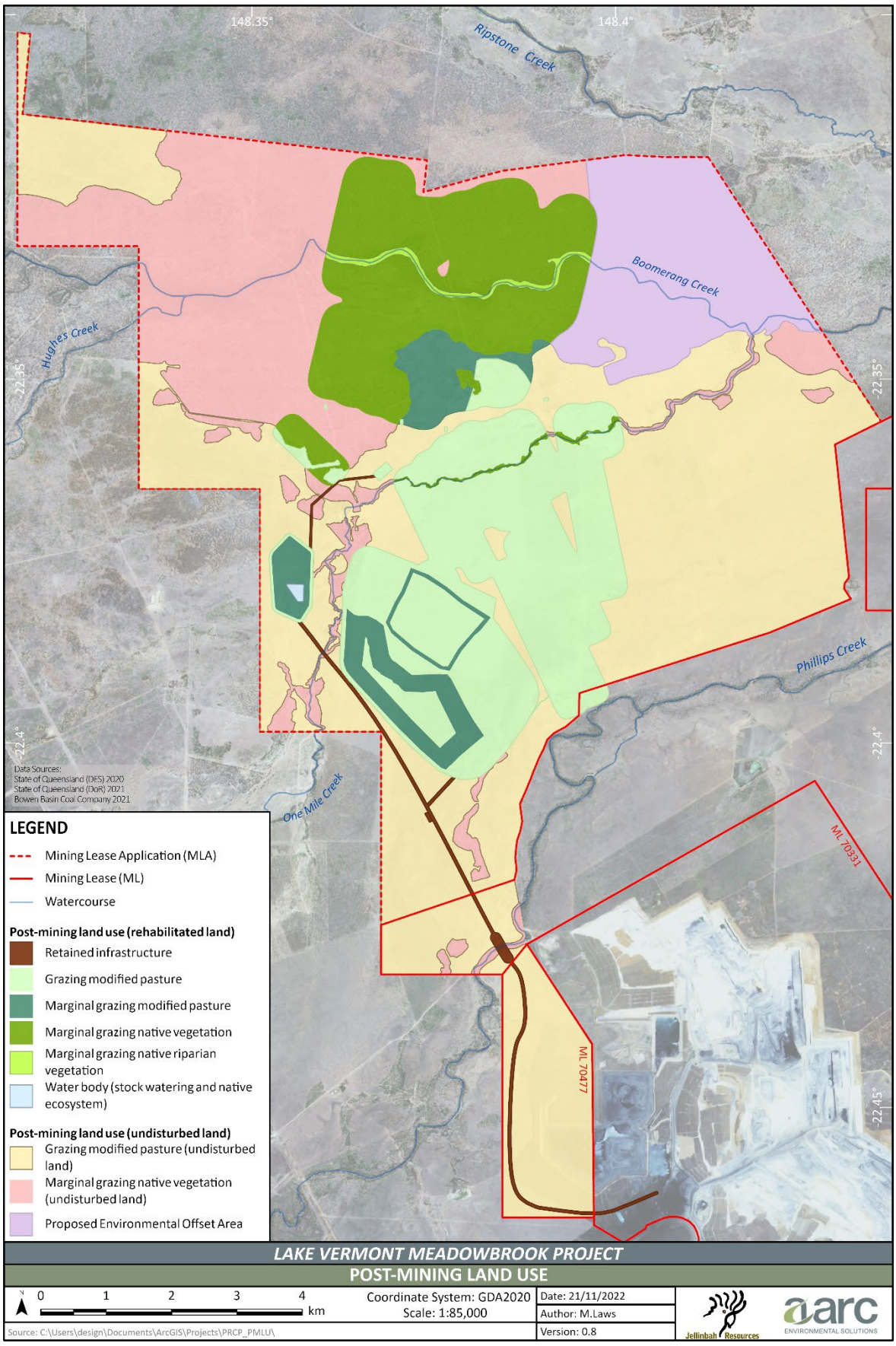

Figure 6.2: Proposed post-mining land use

The disturbance areas referenced in Table 6.2 correspond with the discrete rehabilitation areas that are described in detail in section 6.3.3. A discussion on the development and justification of the proposed PMLUs is provided in sections 6.3.2.1 and 6.3.2.2.

A portion of undisturbed land within the MLA has been nominated for biodiversity offsets, as shown in Figure 6.2. Biodiversity offsets are discussed further in Chapter 10, Terrestrial Ecology, and Chapter 21, Matters of National Environmental Significance.

6.3.2.1 Grazing post-mining land use

The current land use of the Project site is low-intensity cattle grazing (refer section 6.2.4). The Soil and Land Suitability Assessment (Appendix C, Section 6) found that the land suitability class of the Project area for cattle grazing is predominantly limited by soil water availability, pH and nutrient availability. Examination of the land suitability limitations for cattle grazing indicates that the Project area consists of land suitable for cattle grazing with moderate limitations (Class 3) and land considered as marginal grazing land (Class 4) (Appendix C, Soil and Land Suitability Assessment, Section 6). The current low intensity grazing land use indicates that the entire Project area can sustain grazing activities. Based on the characteristics of the available topsoils and the final landform for the site, the proposed PMLUs similarly differentiate between Class 3 (grazing PMLU) and Class 4 (marginal grazing PMLU). In general, the land is expected to retain its pre-mining land class suitability except for:

- areas of the out-of-pit waste rock emplacement that have slopes greater than 10% and develop water erosion limitations that result in Class 4 grazing suitability;
- areas of the in-pit waste rock emplacement that have slopes greater than 10% and develop water erosion limitations that result in Class 4 grazing suitability; and
- the footprint of the mine infrastructure area, which may be subject to characteristics that limit plant growth (i.e. soil compaction and strongly alkaline subsoils), resulting in Class 4 grazing suitability.

Given that waste rock materials have been characterised as NAF, no adverse impact is anticipated with respect to impacts on the proposed PMLU or surface water or groundwater resources arising from the rehabilitated in-pit and out-of-pit waste rock emplacements. The only amelioration activities that may be required will be to address erosion risk when topsoil testing indicates adverse characteristics. Where slopes are less than 10%, rehabilitated lands are expected to achieve a Class 3 suitability for cattle grazing, and where slopes are greater than 10% but do not exceed 20%, land is expected to achieve a Class 4 land suitability.

The open-cut pit will be partially backfilled and revegetated with pasture species suited to the target PMLU. It is expected that parts of the final landform will be subject to intermittent periods of ponding; however, given there is no Class 4 wetness limitation, the land suitability for grazing in these areas will be maintained at Class 3.

Once landform development of the waste rock emplacements and open-cut pit is complete, the flood levee will be reshaped to lower the profile and reduce slopes to be consistent with PMLU of grazing. The area will then be revegetated with pasture grasses to minimise erosion and the generation of sediment-laden runoff.

Subsidence-affected areas will have a final landform designed in consideration of appropriate drainage mitigations to minimise ponding. The pre-mining land suitability class for these areas is based on the SMU and is limited to areas of Class 3 and Class 4 land suitability. These areas are expected to retain their pre-mining land class suitability. Some subsided areas will be subjected to intermittent ponding, over time functioning as ephemeral wetlands, but will remain suitable for the low-intensity grazing PMLU.

Areas cleared of vegetation for the mine and supporting infrastructure areas are proposed to be rehabilitated to pre-existing low-intensity grazing land use. The haul road, including the culverts, is proposed to be retained to support the grazing PMLU. Topsoil stripped and stockpiled will be predominantly from SMUs limited to Class 3 and be suitable as seed surface material and root zone material and, therefore, be compatible with the PMLU. Parts of the MIA are expected to experience various levels of surface compaction, potentially inhibiting plant growth, in addition to having strongly alkaline subsoils, which are expected to limit these areas to land suitability Class 4.

Following mining, infrastructure will be removed unless it is compatible with the PMLU and it provides a benefit or improvement to the use of the land once mining has ceased. The haul road and access roads are consistent with the PMLU of grazing and are proposed to be retained to facilitate site access. One dam is proposed to be retained at closure as a stock water dam. It will be rehabilitated to meet livestock drinking water quality guideline levels (ANZG 2018) and is, therefore, considered to be consistent with the PMLU and will provide a tangible benefit.

The Project site contains a large contiguous area of remnant or high-value regrowth vegetation in the northern portion of the site as well as along riparian corridors associated with Boomerang Creek and One Mile Creek. Some of these areas will be subject to disturbance from subsidence and vegetation clearing. Rehabilitation of these areas will involve reinstating, as far as practicable, the existing vegetation communities.

In summary, the proposed PMLU of low-intensity cattle grazing is achievable through coordinated rehabilitation works to achieve compatible land use that retains the existing economic benefits realised pre-mining.

6.3.2.2 Post-mining land use alternatives

The pre-mining land use assessment (Appendix C, Section 5) has determined that the cropping suitability classes range between Class 4 (marginal land considered unsuitable due to severe limitations) and Class 5 (unsuitable land with severe limitations). No suitable cropping land has been identified in the pre-mining assessment, and none will be created through rehabilitation works. Therefore, cropping is not considered a feasible alternative PMLU.

6.3.3 Rehabilitation areas

To allow the development of a PRCP schedule that satisfies the requirements of the PRCP Guideline, discrete rehabilitation areas (RAs) have been defined for the Project. An RA is defined in the EP Regulation as an area of land in the PMLU to which a rehabilitation milestone for the post-mining use relates. RAs have been nominated for areas of disturbance within the Project by considering the disturbance type and the proposed PMLU, as shown in Table 6.3 and Figure 6.3. The rehabilitation activities applicable to these RAs are described in sections 6.3.4 and 6.3.5.

6.3.4 Rehabilitation milestones and completion criteria

Rehabilitation milestones are defined *as each significant event or step necessary to rehabilitate an area of land to a stable condition* (section 112, EP Act). Key to assessing the achievement of a milestone is the definition of criteria relevant to each milestone. Milestone criteria must be consistent with the SMART (specific, measurable, achievable, realistic and timely) principles. They should:

- be outcome-based (linked to the end land use);
- be flexible to adapt to changing circumstances;
- be able to evolve as the mine life progresses;
- include metrics suitable to demonstrate that rehabilitation is trending positively;
- undergo periodic review; and
- include a measurement approach that details how the criterion will have been met (CoA 2016, ANZMEC and MCA 2000).

A set of milestone criteria has been developed for the Project to provide a clear definition of milestone completion and successful rehabilitation for each rehabilitation area. The milestone criteria demonstrate the completion of progressive rehabilitation steps and events. The completion criteria for each PMLU will be used as the milestone criteria for the final milestone in the proposed schedule to demonstrate achievement of the PMLU to a stable condition at surrender. Completion criteria nominated in the Lake Vermont Rehabilitation

Plan have been integrated into the Meadowbrook milestone criteria to maintain consistency in rehabilitation outcomes.

The nominated rehabilitation milestones considered relevant to the Project area are provided in Appendix B, Progressive Rehabilitation and Closure Plan (section 3.5). It should be noted that not all rehabilitation milestones are applicable to all rehabilitation areas.

Table 6.3: Identified rehabilitation areas

Rehabilitation area reference	Rehabilitation area	Description	PMLU
RA1	Mine infrastructure area	• MIA (except water management infrastructure footprint) • MIA flood levee • electrical substation • drift portals and ventilation shafts	Marginal grazing modified pasture
RA2a	Water management infrastructure (rehabilitated)	• Mine dams rehabilitated to pasture • diversion drains rehabilitated to pasture	Marginal grazing modified pasture
RA2b	Water management infrastructure (retained)	• Mine dams retained as stock watering points	Water body (stock watering and native ecosystem)
RA3	Infrastructure corridor and access roads	• Access/coal haul road and infrastructure corridor • laydown yard • infrastructure corridor linking the MIA to the electrical substation • pit access road	Retained infrastructure
RA4	Open-cut disturbance area (marginal grazing modified pasture)	Open-cut disturbance area, including in-pit and out-of-pit waste rock emplacements and flood levee (slopes >10%)	Marginal grazing modified pasture
RA5	Open-cut disturbance area (grazing modified pasture)	Open-cut disturbance area, including in-pit and out-of-pit waste rock emplacements and flood levee (slopes <10%)	Grazing modified pasture
RA6	Subsidence (marginal grazing native vegetation)	Grazing native vegetation subject to subsidence and some surface disturbance associated with gas drainage bores and access tracks (Class 4 grazing land suitability)	Marginal grazing native vegetation
RA7	Subsidence (grazing modified pasture)	Pasture subject to subsidence and some surface disturbance associated with gas drainage bores and access tracks (Class 3 grazing land suitability)	Grazing modified pasture
RA8	Subsidence (marginal grazing modified pasture)	Pasture subject to subsidence and some surface disturbance associated with gas drainage bores and access tracks (Class 4 grazing land suitability)	Marginal grazing modified pasture
RA9	Subsidence (marginal grazing native riparian vegetation)	Grazing native vegetation on Boomerang Creek riparian zone subject to subsidence	Low intensity cattle grazing of native vegetation in riparian zone

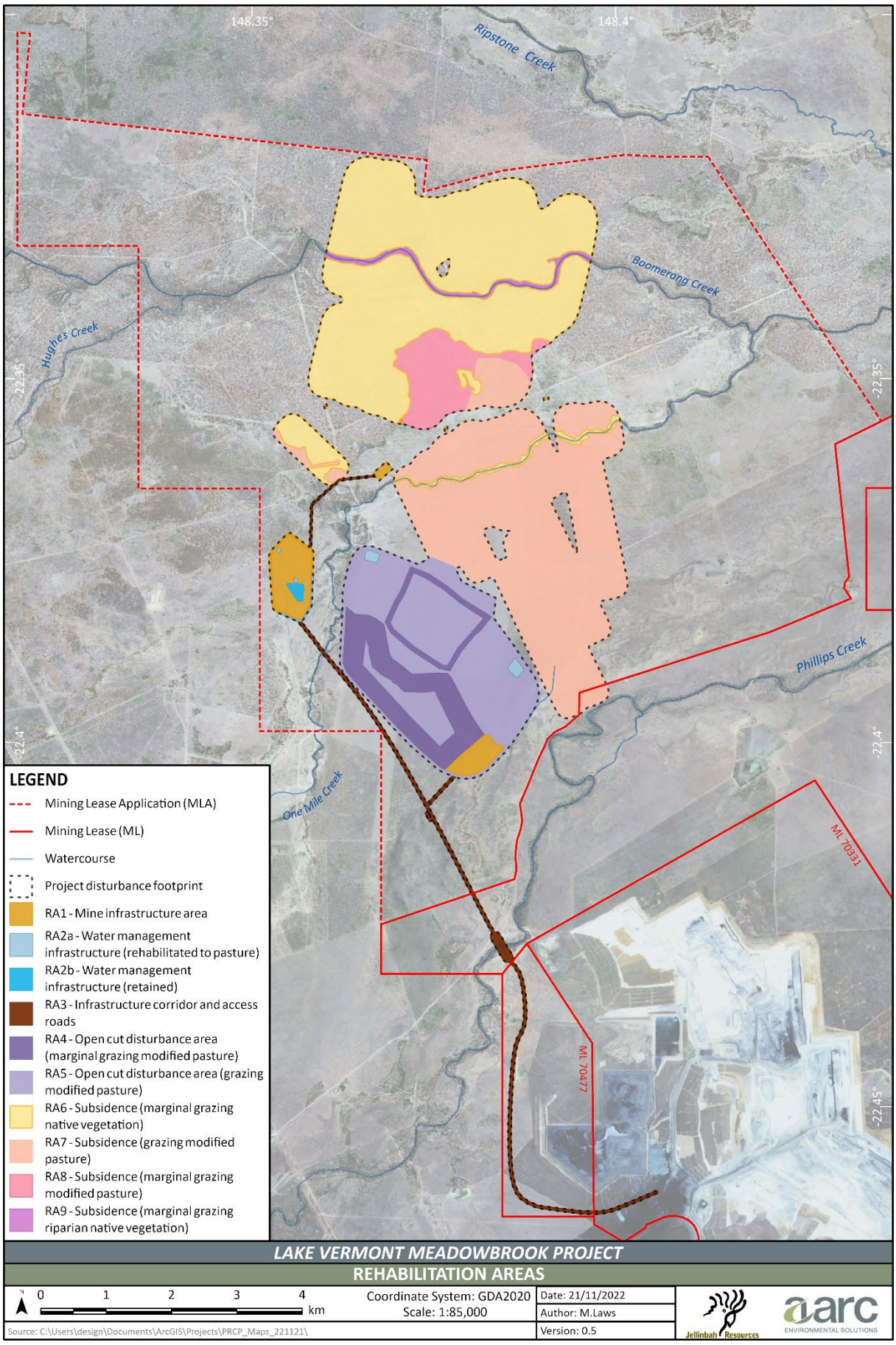

Figure 6.3: Project rehabilitation areas

6.3.5 PRCP schedule and progressive rehabilitation

The development of a milestone schedule is a requirement of the PRCP. The schedule describes time-based milestones for achieving each PMLU for the Project. The rehabilitation milestones must be achieved as soon as practicable after land becomes available for rehabilitation. For the Meadowbrook Project, land is considered to become available for rehabilitation at the completion of mining, except when land is being used for operating infrastructure or topsoil stockpiles or is identified as being retained infrastructure post-closure.

Rehabilitation milestone timeframes have been developed considering the size of the rehabilitation area, the activities applicable to the milestone and interim rehabilitation activities that are scheduled to occur or anticipated to be required prior to the area becoming available for rehabilitation. Timeframes for milestones applicable to the subsidence zones are based on modelling estimates of the scale and location of impacts and will ultimately rely on post-subsidence monitoring to identify areas requiring rehabilitation. Similarly, milestones that involve revegetation activities, including monitoring of revegetation, include a provision for unfavourable growing seasons and unforeseen extreme events, such as droughts or storms, which could negatively impact vegetation establishment and cause longer timeframes for the milestone to be achieved.

Indicative rehabilitation stage plans have been prepared for Project Year 11 (2036) and Project Year 26 (2051), as well as at 1 year and 10 years after completion of mining (2056 and 2065 respectively; refer Figure 6.4 to Figure 6.7). The stage plans demonstrate the sequence of rehabilitation activities and the expected date of achievement of rehabilitation milestones.

6.4 General rehabilitation methods

6.4.1 Topsoil management and surface preparation

Topsoil is a critical factor in achieving successful rehabilitation outcomes and is, therefore, a valuable resource for the Project. Topsoil resources have been identified and described in section 6.2.3 and Appendix C, Soil and Land Suitability Assessment, Section 9. Site clearing within the proposed footprint of the infrastructure corridor, MIA, open-cut satellite pit and waste rock emplacements will generate stripped topsoil that can be used in rehabilitation works. Stripped topsoil will be directly placed in rehabilitation areas when practicable or stockpiled for use in the rehabilitation of the site. When possible, stripped topsoil will be stockpiled to prevent mixing of different SMUs, and stockpiles will, when possible, have a maximum average height of 2 m to allow oxygen to diffuse through the stockpile and assist in maintaining the viability of seed and micro-organisms.

A topsoil inventory will be maintained for the life of the Project to account for the volumes and locations of topsoil to be progressively stripped, stockpiled and reapplied. Prior to topsoil application and seeding in rehabilitation areas, soil nutrient status will be tested to identify potential limitations to revegetation success and ameliorants applied as necessary. When necessary, erosion-prone soils will be ameliorated with gypsum to overcome dispersive properties. Soil ameliorants will also be utilised when necessary to bring soil pH values to within the range of 5.5–9.0, the range most suitable for plant growth (Hazelton and Murphy 2016).

Following land reshaping and profiling (where applicable), topsoil will be placed to achieve a minimum overall thickness of 0.2 m. When possible, topsoil from the local SMU will be used. Topsoil management requirements will be specified in a topsoil management plan as outlined in section 5.5.4. Ripping of the landform shall be undertaken along contours.

Areas affected by subsidence are unlikely to require significant surface preparation, except where the surface has been cleared of vegetation or altered slopes cause an increase in erosion. Where revegetation is required to meet the minimum ground cover requirements, surface preparation activities will be undertaken as necessary.

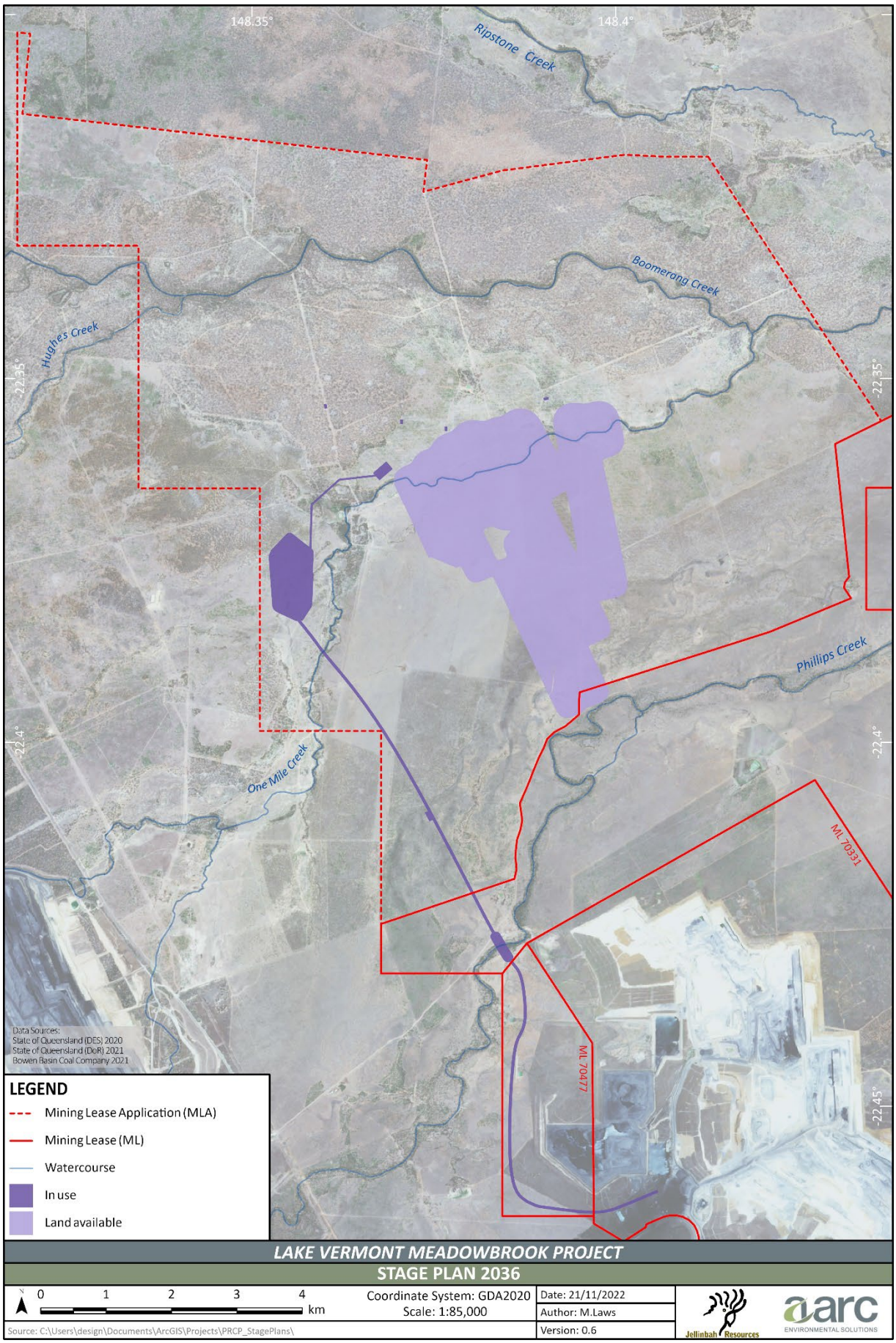

Figure 6.4: Stage Plan 2036

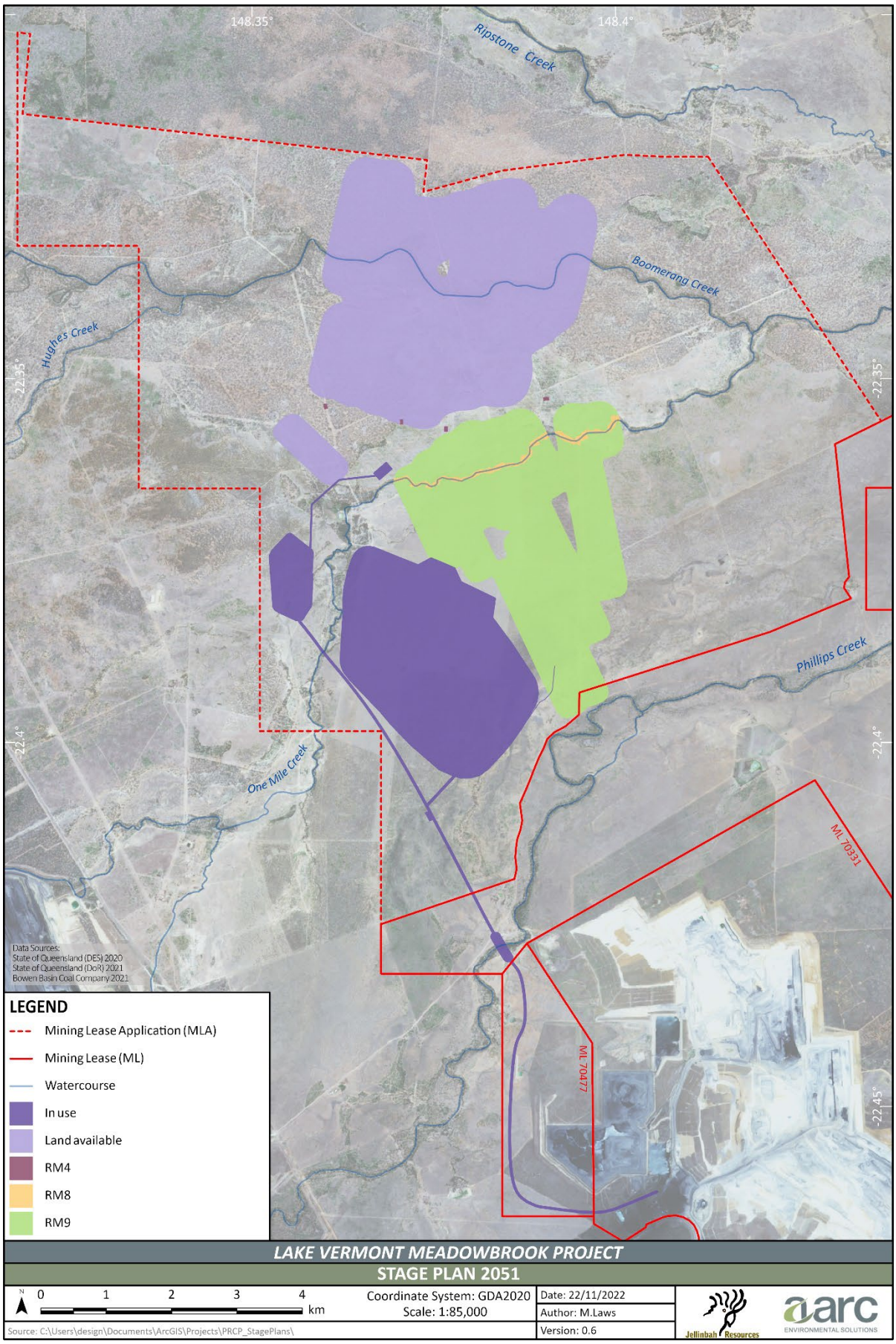

Figure 6.5: Stage Plan 2051

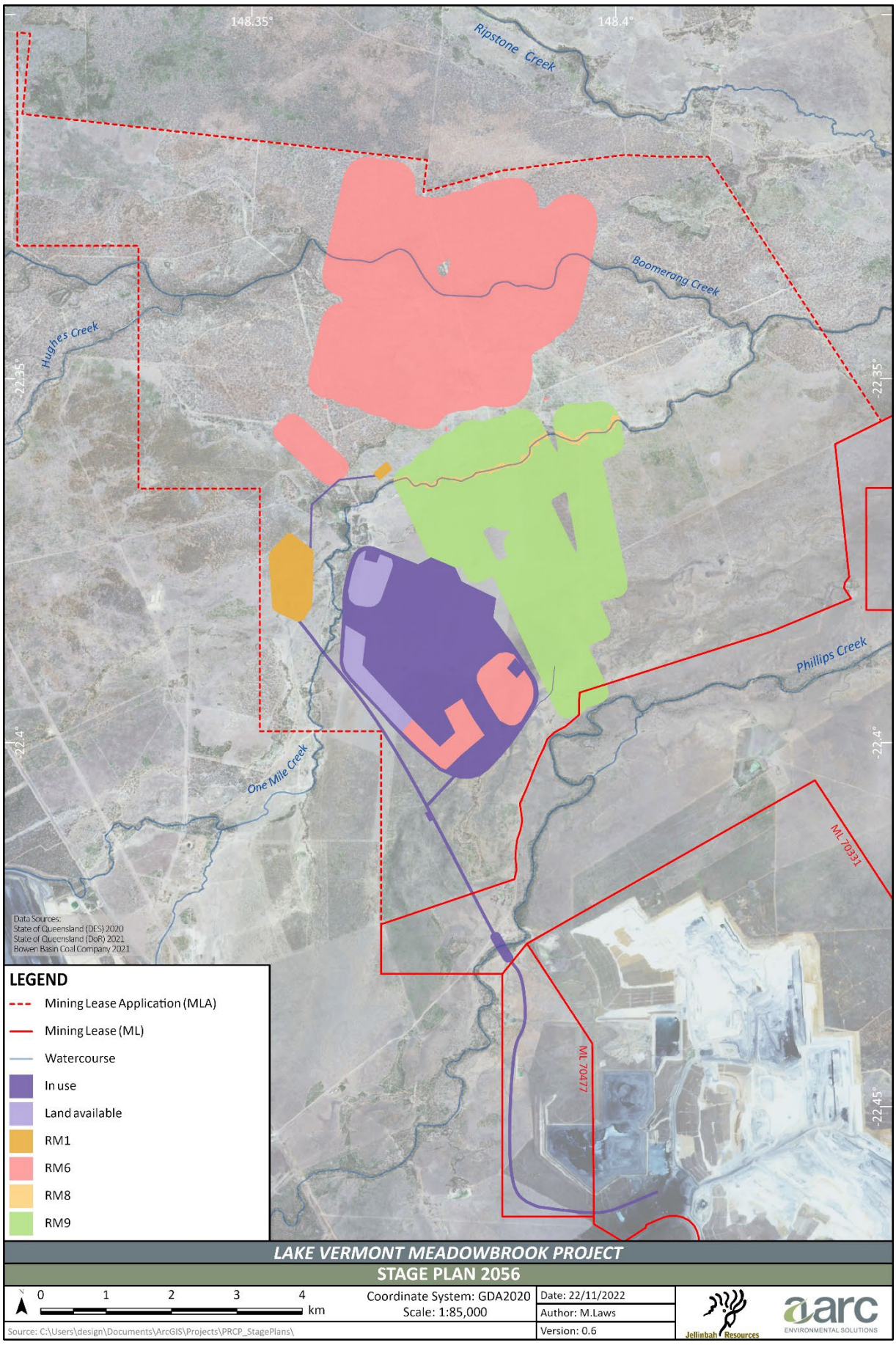

Figure 6.6: Stage Plan 2056

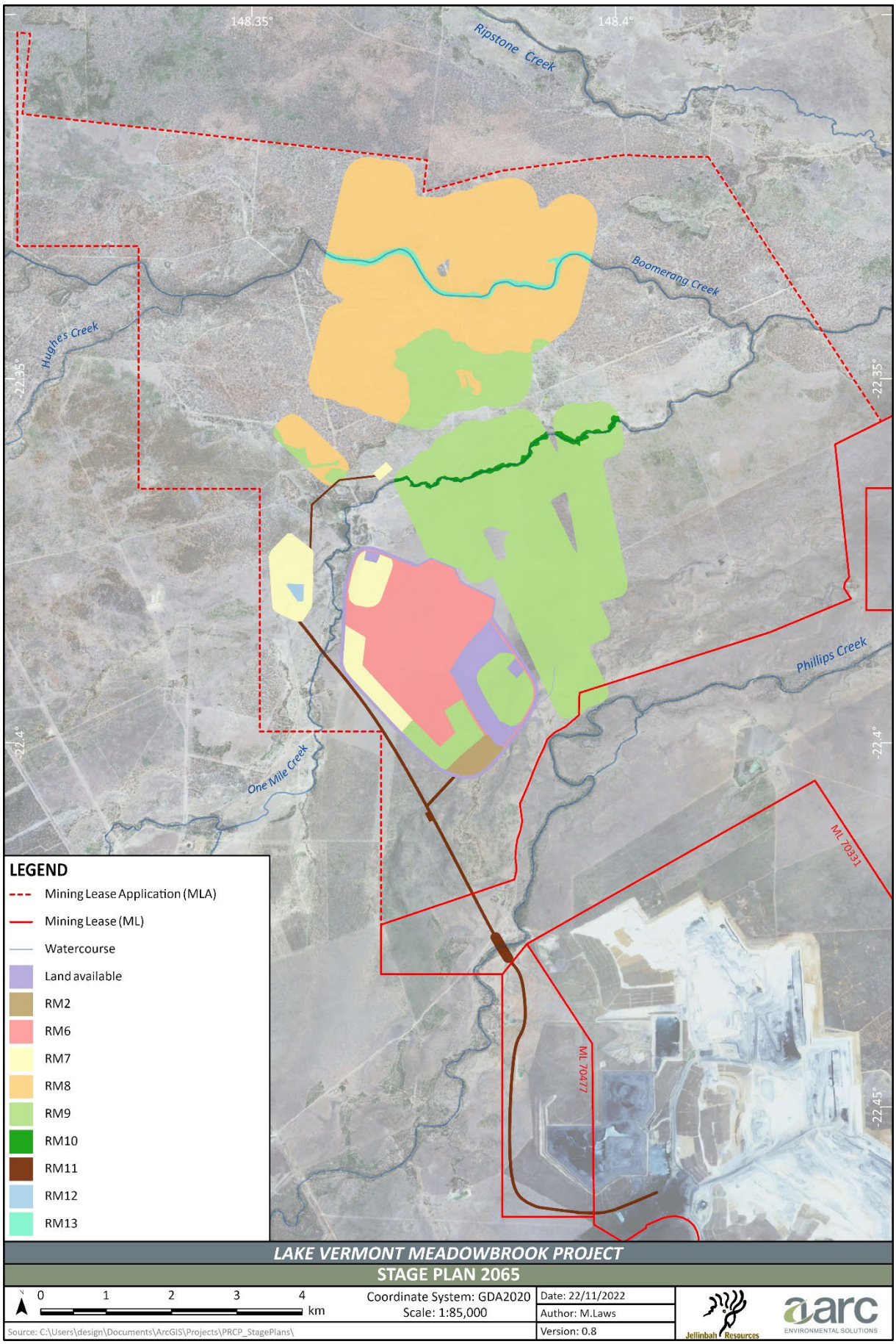

Figure 6.7: Stage Plan 2065

6.4.2 Revegetation

Rehabilitation areas will be revegetated once final land reshaping, topsoil application and surface preparation has been completed. To maximise revegetation success, revegetation activities will be scheduled during spring before the heavy wet season rainfall begins. Seeding may also occur during the summer months, depending on rainfall. Seeds will be sown using direct seeding or tube stock depending on the species, slope gradients and areas to be revegetated.

Grazing areas will be seeded with pasture grass species at the rates indicated in the PRCP (Appendix B, Section 3.5). Where impacts to pasture growth due to subsidence are identified, these areas will be infill planted with pasture species better suited to the changed conditions. The seed mixes provided are indicative only and are subject to change due to seasonal availability. All species listed suit the central highlands climate and site-specific environmental conditions. In addition to pasture species, native overstory trees, such as *Acacia* spp. and Eucalypts, will be planted to provide shade for livestock.

Large-scale revegetation of areas impacted by subsidence is not expected to be required. For any localised areas requiring supplementary planting of native vegetation, native species will be either direct seeded or planted from tube stock. When sourcing native seed stock, the use of local provenance native seed will be prioritised, as it will be better adapted to the Project's edaphoclimatic conditions.

The rehabilitation outcome for areas of native vegetation is to reinstate, as far as practicable, the vegetation communities existing pre-mining. Where vegetation impacts due to subsidence are identified, these areas will be infill planted to replace lost species with comparable vegetation to maintain ecosystem structure and function, and to stabilise soil and minimise erosion. Where impacts occur due to ponding, these areas will be revegetated with species better adapted to the changed hydrological conditions.

Provisional species lists have been developed for the vegetation communities that have the potential to be impacted by subsidence. They are based on vegetation community mapping undertaken at the Project site. A species list has been developed for subsidence zones subject to intermittent ponding and is provided in the PRCP (Appendix B, Section 3.5). These species lists are subject to change based on species suitability and availability and as new information becomes available from rehabilitation monitoring and research.

Areas required to be revegetated will be identified through monitoring undertaken through the Subsidence Management Plan. A revegetation plan will be developed for each impacted area, including recommendations for the proportion of each species to be seeded/planted in any given area based on the species richness, woody stem count and groundcover density of comparable analogue site/s.

6.5 Specific rehabilitation areas

6.5.1 Waste rock emplacements

Spoil produced by the excavation of the open-cut satellite pit will be placed in two out-of-pit waste rock emplacements adjacent to the pit and in-pit as operations progress. Mining of the open-cut satellite pit will commence initially in the south and subsequently in the northern extremities of the defined open-cut mining area and progress towards the centre. Excavated waste rock will initially be placed in the southern end of the western out-of-pit waste rock emplacement area, with dumping progressing towards the north-west. Waste rock will also be placed as fill behind the advancing mining operations. A temporary out-of-pit waste rock emplacement area will be established east of the pit. Material from the out-of-pit waste rock emplacements will be used to partially backfill the remaining pit at the completion of mining, reducing the footprint of the residual western out-of-pit waste rock emplacement and returning the pit area to a landform that is compatible with the PMLU of grazing. Consequently, the final landform of the partially backfilled pit will be relatively flat in the north-west and south-east, with a depression in the centre. The depression will be subject to intermittent periods of ponding but is not expected to be a permanent water body.

For the western out-of-pit waste rock emplacement, the rehabilitated slopes have been designed to have:

- maximum slope angles of 8.1° (14.5%);

- maximum uninterrupted slope lengths of 70 m; and
- stable berms or bunds (minimum 5 m wide) incorporated into the final landforms, where necessary, to manage the flow of water downslope.

Where practicable, surface water ponding and runoff concentrations will be minimised in the rehabilitated landform. In some cases, water may need to be redirected from the top of the waste rock emplacement *via* sufficiently-sized drainage paths. Such channels will act to direct concentrated runoff from the dump surface while minimising potential for erosion. Similar drainage processes can be observed in natural landforms where exposed rock drainages are formed on steeper hills and outcrops.

The final landform of the rehabilitated pit has been designed to reinstate the pre-mining land use to grazing and locate the rehabilitated pit outside the floodplain. The north-west and south-east landform of the in-pit waste rock emplacement will have typical slopes of 1.2° (2%), blending with the surrounding land, while the regraded batter slopes of the rehabilitated pit will have grades of approximately 8.1 (14.5%).

During operation and the initial rehabilitation phases, a temporary flood levee will protect the open-cut pit from floodwater inundation. The flood levee will reduce local floodplain conveyance and storage, which will have the effect of locally increasing upstream flood levels and redistributing downstream flow to the opposite floodplains until the levee is decommissioned and the floodplain landform is returned to one approximating pre-mining conditions.

Modelling has shown that a 0.1% AEP flood event following the decommissioning of the flood levee around the pit would encroach onto the area proposed for the lowest point of the rehabilitated pit. Consequently, the final landform of the open cut disturbance area will be designed to mitigate the risk of inundation of the depression from floods not exceeding the 0.1% AEP flood event. The proposed final site design anticipates a landform having its lowest elevation at approximately 160 mAHD, although this may be adjusted as additional knowledge relating to groundwater behaviour is acquired.

The design of the final pit-area landform is premised on achieving a final elevation above the anticipated recovered groundwater level. A water balance model has been developed to assess the behaviour of the rehabilitated pit landform under various climate scenarios (Appendix X, Rehabilitated Landform , Section 4). Runoff from the surrounding out-of-pit emplacement areas post-closure will be directed away from the central pit area, to limit the catchment area flowing into the depression to principally that of the depression itself; an area of approximately 185 ha. As a consequence, it is anticipated that a shallow intermittent water body will occur within the depressed landform with its existence dependent upon antecedent rainfall and related climate conditions. Water depths are expected to fluctuate within a 1.2 m range above the floor level, well below the overflow level of the rehabilitated pit landform. To maintain a viable PMLU, the floor of the depression will be graded to a single low point which is expected to then hold water intermittently and function as a stock water dam.

Following landform reshaping, the in-pit and out-of-pit waste rock emplacement areas will undergo surface preparation and revegetation, as described in section 6.4, to achieve a PMLU of low-intensity grazing (Class 3) in areas where slopes are less than 5.7° (10%) and marginal grazing (Class 4) in areas where slopes are greater than 5.7° (10%).

Due to the size of the catchment area, it is likely that the central rehabilitated pit depression will be subject to intermittent periods of ponding, but is not expected to be a permanent water body. The water balance model outcomes indicate that water quality will not accumulate salts over time given losses to groundwater and that water quality will remain well below the ‘low-risk’ trigger value (4,000 mg/L) of the applied livestock drinking water quality guideline (ANZG 2018).

Table 6.4: Modelled salinity of the rehabilitated pit measured as TDS

Timeline	TDS (mg/L) under low-salinity scenario			TDS (mg/L) under high salinity scenario		
	Minimum	Median	Maximum	Minimum	Median	Maximum
Long term (>200 years)	144	270	552	249	465	950

6.5.2 Water management infrastructure

6.5.2.1 Water storages

All water infrastructure (sediment dams, clean water dams, mine-affected water dams and supporting pipelines) will be decommissioned as soon as practicable once they are no longer required. A full description of site water storages is provided in Chapter 8, Surface Water.

Water storages not retained at closure will be dewatered, sediment tested and, when unsuitable, removed and walls reprofiled. Where installed, dam liners will be removed and appropriately disposed of in accordance with the methods described in Chapter 15, Waste Management. Dams will then undergo surface preparation and revegetation in accordance with the methods described in section 6.4 to achieve a PMLU of low-intensity grazing (Class 4).

Water storages retained at closure will be rehabilitated for use as stock watering dams. Once no longer required, sediment will be tested against the toxicant default guideline values for sediment quality (ANZG 2018) and removed if it is above the default values. Water quality will be tested against the 'Release Contaminant Trigger Levels and Receiving Waters Contaminant Trigger Levels' specified in the EA and the trigger values for livestock drinking water defined in Australian and New Zealand 'Guidelines for Fresh and Marine Water Quality' (ANZG 2018). If water quality parameters are above low-risk trigger values, water will be treated to reach an acceptable level.

6.5.2.2 Flood levees and diversion drains

Two temporary flood levees are proposed for the Project to protect the open-cut satellite pit and the MIA from flood water ingress resulting from a 0.1% AEP flood event during the operational and initial rehabilitation stages. A full description of the flood levees and diversion drains is provided in Chapter 8, Surface Water.

The flood levee around the open-cut operation will be progressively reprofiled in conjunction with adjacent rehabilitation works as levee sections become obsolete due to reprofiling of the surrounding land. The south-east section of the levee will be retained until landform development of the south-east in-pit waste rock emplacement is complete. The flood levee will be reshaped with a lower profile to be compatible with the surrounding landform. The area will then be revegetated with pasture grasses to prevent erosion and the generation of sediment-laden runoff.

The flood levee around the MIA will undergo the same rehabilitation process as soon as practicable following infrastructure decommissioning.

Two temporary diversion drains are proposed. One will be at the toe of the open-cut levee to allow the free drainage of flood water in the vicinity of this feature and the other will be adjacent to the MIA. The diversion drains will be rehabilitated in conjunction with the associated flood levee as they are no longer needed.

6.5.3 Underground mining

Underground mining activities have the potential to cause land disturbance impacts associated with both subsidence and surface infrastructure development. Potential impacts are described variously in Chapter 5,

Land Resources, Chapter 10, Terrestrial Ecology and Chapter 11, Aquatic Ecology. The management and rehabilitation of disturbed land associated with underground mining is described in sections 6.5.3.1 and 6.5.3.2.

6.5.3.1 Subsidence

The rehabilitation objective for areas affected by subsidence is to return the land to its pre-mining grazing suitability and to reinstate the key environmental values of the landscape. Management and rehabilitation of subsided land will be undertaken where subsidence causes landform changes, such as ponding, erosion or cracking, which are unacceptable in extent or impact.

Monitoring will be undertaken pre- and post-subsidence to assess and validate subsidence predictions. It is expected that greater than 97% of the maximum subsidence will occur within six weeks after longwall mining is completed in each panel. However, as mining progresses, water flow may be impacted in previously subsided land, preventing the full impact of subsidence from being evident until mining of each collection of panels is complete. Mining in the northern portion of the site will occur in two stages resulting in subsidence from the mining of the overlying Leichhardt Lower seam followed by further subsidence from the mining of the underlying Vermont Lower seam. Consequently, land will be considered as not becoming available for rehabilitation until after the completion of mining of the Vermont Lower seam in the south and the north, respectively. Land subject to subsidence will be observed for an additional three wet seasons to allow time for surface cracking to naturally rehabilitate, at which time the land will be considered available for rehabilitation, and the rehabilitation sequence will commence.

Mitigation activities may be necessary prior to the commencement of the rehabilitation sequence proper to prevent environmental harm, as indicated by monitoring. Subsidence impacts will be managed and monitored in accordance with the SMP.

Erosion

Erosion risk will increase in areas of increased slope, particularly in areas where soils have weak structure or dispersive properties (Booroondarra, Mayfair, Mayfair Sodic Variant, Moreton, Parrot, Knockane and Norwich). Where subsidence results in slope increases sufficient to initiate erosion, the following mitigation measures may be implemented:

- regrading of slopes;
- ripping of exposed surfaces;
- revegetation as soon as practicable;
- placement of erosion mitigation features, such as rock or large woody debris; and
- management of livestock to ensure that adequate vegetation cover establishes.

Surface cracking

Where surface cracking is identified, these areas will be monitored according to the SMP. Soils in the southern portion of the Project site are heavy cracking clays capable of self-mulching over cracks and are unlikely to require further rehabilitation works. Minor cracks are not expected to require remediation and will resolve through geomorphological processes over time. However, where minor surface cracks do not resolve within three wet seasons, the area will be scarified or ripped to fill minor cracks, control erosion and assist revegetation. Larger or persistent cracks that are identified as requiring remediation will be rehabilitated through removal of topsoil, backfilling, re-spreading of topsoil, and natural regeneration and recruitment. Remediation works will be initiated considering locations of conservation significant species and ecosystems and remediation without machinery undertaken when beneficial. The SMP will integrate an adaptive management approach such that when unpredicted subsidence impacts and environmental consequences occur, previously approved processes will be considered to prevent their re-occurrence. Livestock may be excluded from areas undergoing active subsidence.

Ponding and drainage

Subsidence is predicted to result in some pooling of water isolated from main drainage paths, forming ephemeral wetlands. Drainage works are proposed to be implemented to provide a level of mitigation of these changes to surface water flow, reducing both the extent and the duration of ponding (Figure 6.8). Drainage works will include:

- a drainage channel to alleviate the extent of downstream ponding within the subsidence panels immediately to the north of Phillips Creek that will divert flows downstream to a tributary of Phillips Creek;
- the strategic placement of two small bunds (each approximately 1 ha) across subsidence panels to prevent floodwaters flowing north and into One Mile Creek; and
- a drainage channel to alleviate the extent of ponding in the subsidence panels to the south of Boomerang Creek.

The channels will be a maximum depth of 2.8 m and a base width of 5 m in the northern underground area and a maximum depth of 3 m and a base width of 5 m in the southern underground area. The proposed drainage works is likely to include some minor disturbance outside the unmitigated ponding footprint; however, the mitigated ponding and drainage works combined are substantially less than the unmitigated ponding footprint, as shown in Figure 6.8. The drainage works are expected to reduce the area subject to intermittent ponding from 370 ha to 213 ha, with an additional 4 ha for the drainage channels. The duration of ponding in these depressions depends on the depth and duration of rainfall, with ponded water persisting until it evaporates or seeps into the underlying soil. In the absence of seepage, depending on their depth, the ponds can be expected to persist for several months post-filling. The mitigation works will reduce the depth of ponds, reducing the time expected for water to seep or evaporate.

Areas of residual ponding will be monitored for changes to existing vegetation communities. Where vegetation impacts occur due to ponding, native vegetation areas will be revegetated with suitable native species adapted to the changed conditions to maintain ecosystem structure and function as far as practicable. The species list provided in the PRCP (Appendix B) has been developed based on the native vegetation communities already present at the Project site, with the selected species tolerant of any potential ephemeral ponding conditions.

Some areas expected to be subject to intermittent ponding occur on sodic soils, which have a higher risk of erosion due to the dispersive qualities of the soil. These areas are predominantly on land to be rehabilitated to pasture. The ponded areas are expected to be deposition zones, however there is a risk of tunnel and gully erosion occurring on slopes. This risk will be minimised by instigating erosion control measures as soon as any areas of high erosion potential are identified and revegetating with appropriate pasture species to achieve sufficient groundcover to stabilise soils.

Creek channels

The subsidence areas underlying Boomerang Creek and One Mile Creek are associated with the Parrot SMU, a sandy loam with weak structure. These areas are at high risk of erosion due to predicted temporary increases in flow rates compounded by the dispersive character of soils. Stabilisation of watercourses is expected to occur over time and with the implementation of effective rehabilitation strategies. The rehabilitation milestone criteria and PRCP schedule reflect that mitigation and maintenance measures are expected to be required in some areas for several years following longwall retreat, with continued monitoring to assess the trajectory towards a stable condition. The SMP will assess the changes in bed levels and the impact of increased localised sedimentation, and mitigation activities will be undertaken as necessary. Rehabilitation activities may commence prior to the land becoming available to stabilise banks, prevent erosion and maintain streamflow. Temporary or permanent erosion management will be implemented as needed and may include:

- revegetation of stream banks;
- exclusion of stock from stream bed and banks; and
- construction of rock armouring.

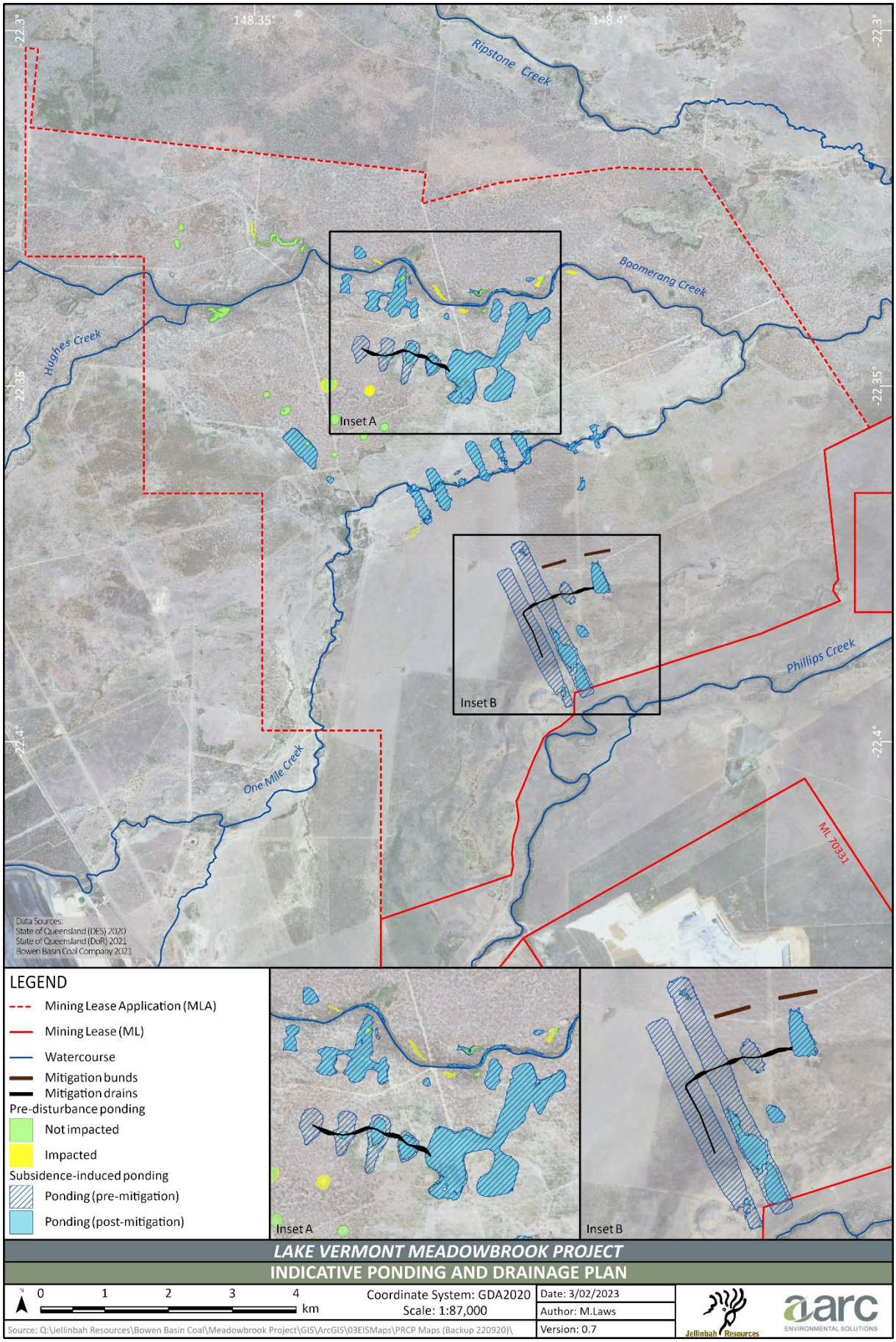

Figure 6.8: Indicative ponding and drainage plan

6.5.3.2 Supporting surface infrastructure

All underground mining surface infrastructure will be removed as soon as practicable at the end of its service life, and the associated land will progressively be rehabilitated as it becomes available. The development of gas wells and associated access tracks will occur progressively over the life of the mine. As a result, at any given time, small areas within the subsidence footprint are likely to be disturbed (in the order of 2 ha), while previously disturbed areas will be in various stages of rehabilitation. The gas well decommissioning process will involve:

- disconnecting and removing all surface and downhole equipment;
- plugging/capping the well to remove any connection with the surface atmosphere;
- removing protruding casing/piping to below surface level;
- ensuring the surveyed location of the hole is correct; and
- rehabilitating the site in accordance with the site rehabilitation management plan.

Ventilation shafts and the underground drift portal entrances will be backfilled with waste material and sealed prior to revegetation with species suitable for the PMLU. The sealing of the drift and shafts will be carried out using standard design practices to mitigate the risk of unplanned subsidence. The design of the bulkhead seals will consider aspects such as the materials used, the requirement for additional ground support and the impact of groundwater. Sealing of the underground drifts will begin as soon as practicable following completion of underground mining. The underground portals surface within the MIA is planned to remain in use until completion of mining of the open-cut operation and part-way through post-closure activities. Therefore, rehabilitation of the portals will occur at the same time as the MIA. The area will be graded, topsoiled, ripped and seeded in accordance with revegetation processes described in section 6.4.2. Any new tracks developed for mining operations will be rehabilitated to the PMLU nominated for the associated infrastructure area. Existing tracks do not constitute new disturbance; therefore, they do not require rehabilitation.

6.5.4 Mine infrastructure

At the end of the Project life, all remaining infrastructure will be decommissioned and removed except when an agreement exists with the underlying landholder that transfers liability for that infrastructure to the landholder. The haul road, including the causeways across Phillips Creek and One Mile Creek, and access roads are consistent with grazing PMLU and are proposed to be retained. It is noted that the disturbance required to support construction of the Phillips Creek crossing will be approximately 100 m wide. This width is required to facilitate excavation and grading of the channel bed to maintain existing flow velocities through this section of the stream (including the proposed culverts). Revegetation works will be undertaken as part of culvert construction activity.

The major infrastructure facilities proposed at the Project site include:

- 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;
- 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;
- substation and electricity distribution infrastructure;

- diesel backup generator;
- main surface fan installation;
- potable water treatment plant;
- sewage treatment plant (STP);
- infrastructure associated with underground mining, including ventilation shafts and gas wells; and
- the infrastructure corridor comprising:
    - an access and coal haulage road;
    - an overhead 66 kV electricity transmission line;
    - a raw water supply pipeline; and
    - telecommunications infrastructure.

All mine infrastructure within the MIA (except the underground drifts and portals (refer section 6.5.3.2) is expected to be required at least until mine closure, with some infrastructure likely to be required to support rehabilitation works. The infrastructure corridor and associated infrastructure will be required until the backfilling of the open-cut satellite pit is complete. All infrastructure not being retained will be decommissioned as soon as practicable once the service life of the infrastructure has passed.

Equipment decommissioned from the Project will be repurposed to other operations when practicable. The Lake Vermont Mine facilities will continue to operate and facilitate disposal of regulated and non-regulated waste as the Project is rehabilitated.

Following infrastructure decommissioning, a contaminated land site investigation will be undertaken in the MIA and infrastructure corridor by an appropriately qualified person. If contamination is identified, a remediation plan will be developed. Following remediation activities, a validation report will be prepared to verify that the remediation actions are adequate and the site is suitable for the proposed PMLU.

Disturbed land not containing retained infrastructure will undergo surface preparation and revegetation in accordance with the methods described in section 6.4 and section 6.5.4 to achieve a PMLU of low-intensity grazing (Class 4).

6.5.5 Coal reject disposal

The existing Lake Vermont Mine co-disposal system (i.e. the simultaneous disposal of coarse and fine reject material) will be used to manage coal reject material from the Meadowbrook Project in combination with reject from the existing Lake Vermont Mine. The current co-disposal management system is designed and operated to meet the conditions stipulated within the current Lake Vermont Mine EA. The Project mines the same coal seams, exhibiting the same coal qualities and characteristics as the current Lake Vermont Mine, so there will be no material change in the characteristics of the resulting rejects. Refer to Appendix D 'Geochemical Assessment of Mining Waste Materials', Section 5 and Section 6, which confirms that the coal samples tested, and potential coal reject materials are classified as non-acid forming due to the excess ANC and low oxidisable sulphur content. The material represented by these coal samples has a low risk of acid generation and a high factor of safety with respect to potential acid and metalliferous drainage.

Approximately 14.8 Mt of coal reject material will be produced from the Project underground mining activities and approximately 2.8 Mt from open-cut mining activities—a total of approximately 17.7 Mt. Coal reject produced by the Project will be disposed of along with coal reject produced by the Lake Vermont Mine within the Lake Vermont Mine co-disposal area (CDA), utilising existing, approved co-disposal cell capacity, from Project Year 1. Prior to capacity being reached within existing cells, further approval will be sought to construct additional cells adjacent to those already existing at Lake Vermont Mine. Beyond this, additional reject disposal capacity will become available within approved residual voids at the Lake Vermont Mine, with in-pit disposal of coal rejects subject to independent approvals.

Table 6.7 and provide an annual forecast of the ROM coal feed and rejects generated by the Coal Preparation Plant. Table 6.7 additionally shows the progressive utilisation and completion of the individual co-disposal dam areas, with the eventual transfer of rejects to the Lake Vermont South Pit final void which becomes available in 2039. The South Pit final void will provide more than ample capacity for rejects disposal for the remainder of the combined mine life.

The current and future planned co-disposal dams are regulated structures that have been and will be designed and constructed to appropriate approved standards. The structures are certified and regularly inspected as per state government regulations. Figure 6.10 shows the location and configuration of the current and future planned co-disposal areas as well as the location of the South Pit final void. CDA1, CDA2 and CDA3A are currently in operation while CDA3B is currently under construction.

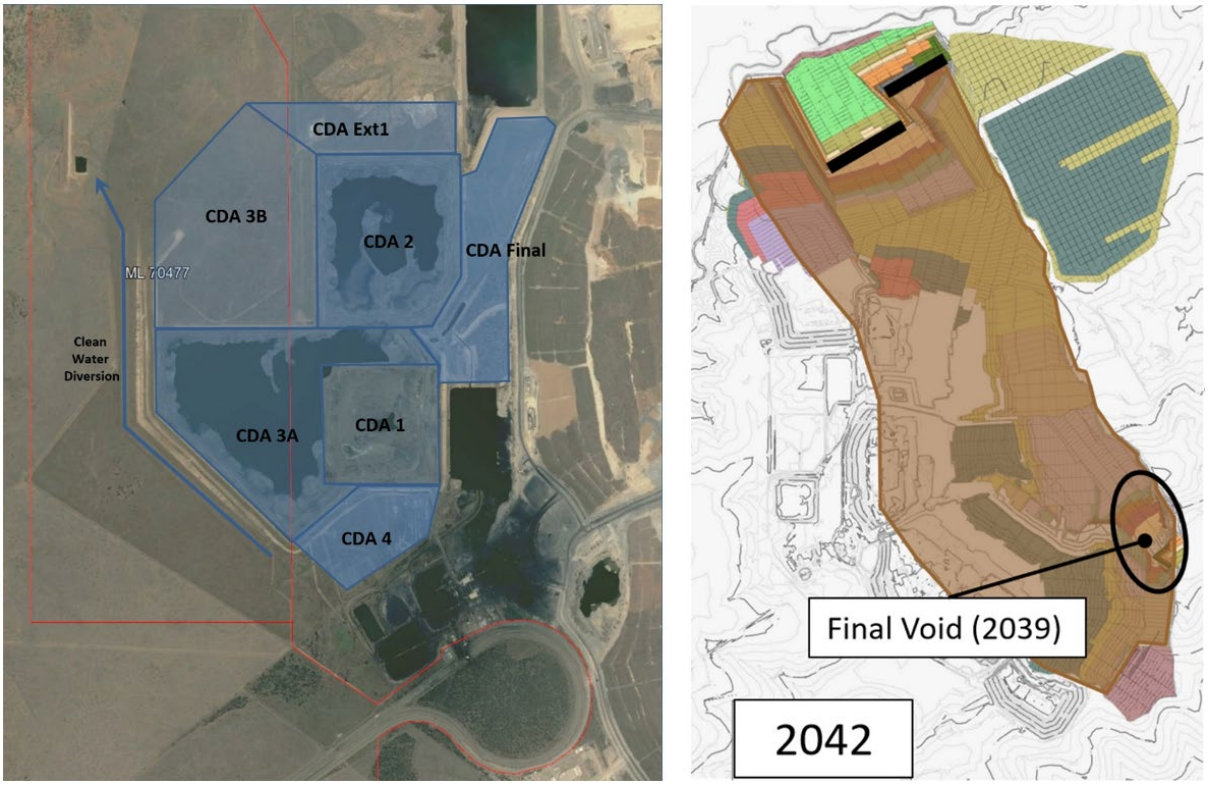

Figure 6.9: Current/planned co-disposal areas and South Pit final void - Lake Vermont Mine

The Lake Vermont Mine CDAs and residual voids will be rehabilitated in accordance with the Lake Vermont Rehabilitation Plan, as described below.

The Lake Vermont Mine CDA will be rehabilitated to a PMLU of marginal grazing. The landform will be designed to be water shedding and will be topsoiled, shaped and profiled to be consistent with Lake Vermont spoil emplacement areas before topsoil placement and revegetation.

The Lake Vermont Mine residual voids have been designated as NUMAs. The area and location of residual voids in the final landform will remain consistent with that authorised in past versions of the EA (2015) and the EA amendment application for the Vermont North mining extension in 2015. Residual voids will be left in a safe and stable condition by reshaping of spoil and *in situ* material to achieve geotechnically stable slopes. Construction of a safety bund will occur around each void to limit human and livestock/animal access. The safety bund wall will be constructed to a minimum height of 2 m and a minimum base width of 4 m and located around the boundary of the NUMA area. Warning signs and exclusion fencing will be erected along the perimeter of voids. Residual voids will be non-polluting.

Table 6.5: Annual rejects disposal location

	CHPP					Co-Disposal Dam Area							
						CDA1	CDA2	CDA3A	CDA3B	CDAExt1	CDA4	CDA Final	LV South Pit Void
						Maximum Dam Capacity							
	Extension Project Coal Feed (ROMt x 10^6)	Lake Vermont Coal Feed (ROMt x 10^6)	Total Coal Feed (ROMt x 10^6)	Rejects (t x 10^6)	Rejects Volume (m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)	(m^3 x 10^6)
						6.9	11.0	13.3	10.8	4.2	4.0	7.0	
						Volume Used							
FY2022		11.2	11.2	2.9	2.2	6.0	8.3	6.1	0.0	0.0	0.0	0.0	0.0
FY2023		11.1	11.1	3.0	2.3	6.3	9.1	7.2	0.0	0.0	0.0	0.0	0.0
FY2024		11.0	11.0	3.1	2.4	6.6	9.6	8.0	0.7	0.0	0.0	0.0	0.0
FY2025		10.9	10.9	3.0	2.3	6.9	10.2	8.8	1.4	0.0	0.0	0.0	0.0
FY2026	0.1	10.7	10.8	3.0	2.3	6.9	10.6	10.2	1.9	0.0	0.0	0.0	0.0
FY2027	0.4	10.4	10.8	3.0	2.3	6.9	11.0	10.8	3.0	0.2	0.0	0.0	0.0
FY2028	3.9	6.9	10.8	2.6	2.0	6.9	11.0	11.4	4.0	0.9	0.0	0.0	0.0
FY2029	6.4	4.4	10.8	2.1	1.7	6.9	11.0	11.9	5.0	1.5	0.0	0.0	0.0
FY2030	6.7	4.1	10.8	2.0	1.6	6.9	11.0	12.3	6.0	1.7	0.0	0.0	0.0
FY2031	6.9	3.9	10.8	2.0	1.6	6.9	11.0	12.6	7.0	2.0	0.0	0.0	0.0
FY2032	6.3	4.5	10.8	2.1	1.7	6.9	11.0	13.1	7.6	2.5	0.0	0.0	0.0
FY2033	5.3	5.5	10.8	2.4	1.9	6.9	11.0	13.3	8.8	2.8	0.0	0.0	0.0
FY2034	5.4	5.4	10.8	2.6	2.1	6.9	11.0	13.3	9.8	3.2	0.4	0.0	0.0
FY2035	4.9	5.9	10.8	2.7	2.1	6.9	11.0	13.3	10.5	3.8	1.2	0.0	0.0
FY2036	5.4	5.4	10.8	2.6	2.1	6.9	11.0	13.3	10.8	4.2	2.6	0.0	0.0
FY2037	3.9	6.9	10.8	2.7	2.1	6.9	11.0	13.3	10.8	4.2	3.0	1.6	0.0
FY2038	4.9	5.9	10.8	2.6	2.0	6.9	11.0	13.3	10.8	4.2	3.3	3.5	0.0
FY2039	5.4	5.4	10.8	2.6	2.0	6.9	11.0	13.3	10.8	4.2	3.6	5.2	0.0
FY2040	5.9	4.9	10.8	2.5	1.9	6.9	11.0	13.3	10.8	4.2	3.8	7.0	0.0
FY2041	4.5	6.3	10.8	2.5	1.9	6.9	11.0	13.3	10.8	4.2	4.0	7.0	1.7
FY2042	4.7	6.1	10.8	2.4	1.8	6.9	11.0	13.3	10.8	4.2	4.0	7.0	3.7
FY2043	5.1	5.1	10.2	2.2	1.7	6.9	11.0	13.3	10.8	4.2	4.0	7.0	5.5
FY2044	4.6	5.2	9.8	2.2	1.7	6.9	11.0	13.3	10.8	4.2	4.0	7.0	7.2
FY2045	5.0	3.4	8.4	1.8	1.4	6.9	11.0	13.3	10.8	4.2	4.0	7.0	8.8
FY2046	6.8	1.6	8.4	1.8	1.4	6.9	11.0	13.3	10.8	4.2	4.0	7.0	10.2
FY2047	5.7	2.7	8.4	2.0	1.6	6.9	11.0	13.3	10.8	4.2	4.0	7.0	11.6
FY2048	4.2	4.2	8.4	2.2	1.7	6.9	11.0	13.3	10.8	4.2	4.0	7.0	13.2
FY2049	1.4	3.1	4.5	1.2	1.0	6.9	11.0	13.3	10.8	4.2	4.0	7.0	14.9
FY2050	1.5	2.7	4.1	1.2	0.9	6.9	11.0	13.3	10.8	4.2	4.0	7.0	15.9
FY2051	1.4	2.1	3.5	1.1	0.8	6.9	11.0	13.3	10.8	4.2	4.0	7.0	16.8
FY2052	1.3	2.2	3.5	1.1	0.8	6.9	11.0	13.3	10.8	4.2	4.0	7.0	17.6
FY2053	1.5	2.0	3.5	1.0	0.8	6.9	11.0	13.3	10.8	4.2	4.0	7.0	18.5
FY2054	1.9	1.6	3.5	0.9	0.7	6.9	11.0	13.3	10.8	4.2	4.0	7.0	19.2
FY2055	0.4	2.2	2.6	0.7	0.5	6.9	11.0	13.3	10.8	4.2	4.0	7.0	19.9
FY2056		1.5	1.5	0.4	0.3	6.9	11.0	13.3	10.8	4.2	4.0	7.0	20.5
FY2057		1.4	1.4	0.4	0.3	6.9	11.0	13.3	10.8	4.2	4.0	7.0	20.8
FY2058		1.4	1.4	0.4	0.3	6.9	11.0	13.3	10.8	4.2	4.0	7.0	21.1
FY2059		1.2	1.2	0.3	0.3	6.9	11.0	13.3	10.8	4.2	4.0	7.0	21.4
FY2060		0.8	0.8	0.3	0.2	6.9	11.0	13.3	10.8	4.2	4.0	7.0	21.7
FY2061		0.6	0.6	0.2	0.2	6.9	11.0	13.3	10.8	4.2	4.0	7.0	21.9

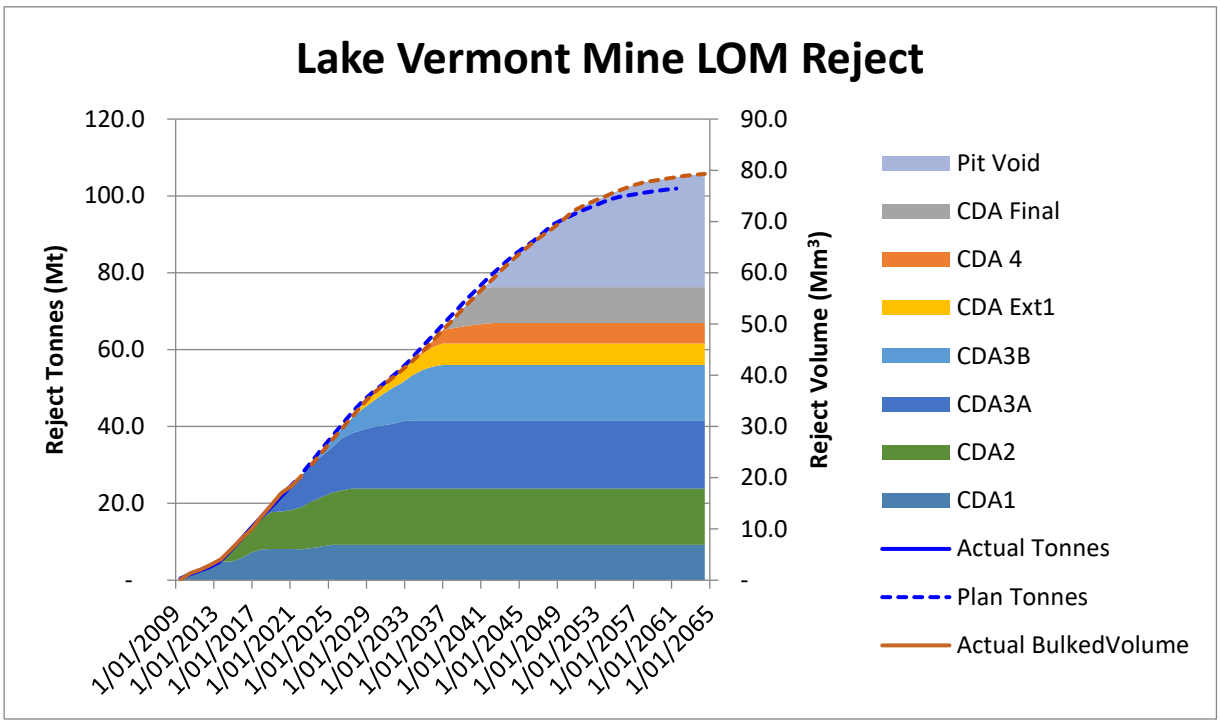

Figure 6.10: Volume and disposal location of reject - Lake Vermont Mine and the Project combined

6.6 Monitoring and maintenance

6.6.1 Monitoring

For the purposes of developing the PRCP schedule, 14 rehabilitation milestones have been proposed as being applicable for the Project. The PRCP Guideline requires consideration of measures to be undertaken to demonstrate that milestones and milestone criteria have been achieved.

With respect to determining the achievement of rehabilitation milestones, clearly defined milestone criteria have been developed for each rehabilitation milestone (see Section 3.5.3 Appendix B, Progressive Rehabilitation and Closure Plan). Assessment of rehabilitation against the milestone criteria will be incorporated into the ongoing environmental management for the Project.

Monitoring of areas predicted to be affected by subsidence will commence prior to disturbance to establish a baseline dataset able to assist in identifying areas where mitigation activities may be necessary earlier than the scheduled rehabilitation process nominates. Monitoring of rehabilitated areas will commence following the completion of activities required to meet the first rehabilitation milestone applicable to the relevant rehabilitation area.

The completion criteria for each PMLU will be used as the milestone criteria for the final milestone in the proposed schedule, which shows achievement of the PMLU to a stable condition at surrender. When the final rehabilitation milestone applicable to the rehabilitation area is deemed to be satisfied, a final rehabilitation assessment will be undertaken before an application for progressive certification or ML surrender is made.

Rehabilitation will be monitored on an annual basis, with the survey period occurring post-wet season, as monitoring at this time will allow for more accurate identification of the species present and a clearer understanding of species richness on-site. When sufficient data is acquired that demonstrates that rehabilitation is on a trajectory to achieve the milestone criteria, the frequency of monitoring may be reviewed.

Rehabilitation monitoring data collected will include, but not necessarily be limited to:

- species richness;
- vegetation recruitment;
- photographic monitoring;
- erosion;
- topsoil parameters; and
- surface water and groundwater parameters.

6.6.2 Maintenance

Rehabilitation indicators and visual observations will be used to identify any aspects of a rehabilitated area that are of concern or suggest that rehabilitation is not on a trajectory to meeting the required completion criteria, such as:

- evidence of active erosion;
- inadequate vegetation cover or growth;
- invasive weed or pest species;
- soil dispersion/instability; and/or
- soil infertility.

Following monitoring events, areas of rehabilitation will be assessed for maintenance requirements. An annual visual inspection of all rehabilitated areas will be undertaken to provide an overview of the status of the rehabilitation and identify any noticeable issues, such as erosion or inadequate vegetation cover or growth. This information, along with monitoring results, will be used to inform the maintenance schedule.

Maintenance may include repairing areas of excessive soil erosion or undertaking supplementary plantings or seeding to increase floristic diversity and cover to assist in achieving completion criteria.

If issues re-occur, an investigation will be conducted to determine the reason and allow for remediation. Modification of rehabilitation methods and specifications may be required and rehabilitation and maintenance planning updated accordingly.

6.7 Closure and relinquishment

As stated in section 6.1.1, the PRCP for the Project states the measurable completion criteria against which the Project rehabilitation activities will be assessed to determine the extent to which the rehabilitation milestones for each rehabilitation area have been achieved.

At the point in time that rehabilitation monitoring for a give rehabilitation area indicates that the milestone criteria for the final milestone has been met (i.e. demonstrated achievement of the land to a stable condition consistent with the PMLU), the Proponent will either:

- apply for progressive certification of the area of land that has been successfully rehabilitated; or
- apply to surrender the EA over the relevant area that has been successfully rehabilitated and, if required, submit a post-surrender management report that states any requirements for the ongoing management of the land.