PROGRESSIVE REHABILITATION AND CLOSURE PLAN
New Oakleigh Mine

PREPARED FOR
New Hope Group

30 SEPTEMBER 2021

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Cover Page

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Table of Contents

List of Figures

List of Tables

List of Appendices

Table of Abbreviations

ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
CA	Compensation Agreement
CCAP	Community Consultation and Awareness Program
CHPP	Coal handling and preparation plant
EA	Environmental Authority EPML00350213
EC	Electrical conductivity
EMOS	Environmental Management Overview Strategy
EP Act	*Environmental Protection Act 1994*
EPA	Environmental Protection Agency
ERA	Environmentally relevant activity
FOS	Factor of safety
FPC	Foliage Projective Cover
ICC	Ipswich City Council
LOD	Land outcome document
ML / MLs	Mining Lease / Mining Leases
MTI	Medical Treatment Injury
NOC	New Oakleigh Coal Pty Ltd
NUMA	Non-use management area
OEL	Occupational Exposure Level
PI	Permanent Impairment
PLA	Priority Living Area
PMLU	Post-mining land use
PoO	Plan of Operations
PRCP	Progressive Rehabilitation and Closure Plan
PRCP Guideline	Progressive Rehabilitation and Closure Plan Guideline (DES 2019)
Project	New Oakleigh Coal Mine
RDPO	Rosewood District Protection Organisation
RE	Regional Ecosystem

ROM	Run-of-mine
RUSLE	Revised Universal Soil Loss Equation
SEP	Stakeholder Engagement Plan
SGRS	Sherwood Geotechnical and Research Services
TDS	Total Dissolved Solids
WEPP	Water Erosion Prediction Program

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by New Hope Group (New Hope) to develop a transitional Progressive Rehabilitation and Closure Plan (PRCP) for the New Oakleigh Coal Mine (Project) in accordance with the requirements of the *Environmental Protection Act 1994* (EP Act).

This transitional PRCP is applicable to Mining Leases (MLs) 4568, 4584, 4675, 4683, 4698, 4699 and 50175. The current version of the Environmental Authority EPML00350213 (EA) for the Project was issued on 23 January 2015 to New Oakleigh Coal Pty Ltd (NOC), the owner and operator of the Project and a wholly owned subsidiary of New Hope.

The EA authorises the environmentally relevant activity (ERA) of ERA 13 'mining black coal' under Schedule 3 of the Environmental Protection Regulation 2019 (schedule 2A of the Environment Protection Regulation 2008 at the time of issue).

1.1 Scope and objective

The purpose of this PRCP is to describe how progressive rehabilitation will be carried out at the Project. The PRCP has been developed in accordance with the requirements of the Progressive Rehabilitation and Closure Plan Guideline (DES 2019) (PRCP Guideline), which states that the PRCP must include the following parts:

Rehabilitation Planning part:

The purpose of the rehabilitation planning part of the PRCP is to support and justify the development of the proposed PRCP schedule. This part must detail how progressive rehabilitation and closure will be carried out over the entire Project site and on both a rehabilitation area basis and improvement area basis. The key components of the rehabilitation planning part for the Project are:

- community consultation information (refer section 3.2);
- post-mining land use (PMLU) and/or non-use management area (NUMA) determination (refer section 3.3);
- rehabilitation and management methodology (refer section 3.5);
- risk assessment (refer section 3.5.9); and
- a monitoring and maintenance program (refer section 3.7).

Rehabilitation Schedule part:

The Rehabilitation schedule is a required element of a PRCP. Once approved, the schedule becomes a legally binding and enforceable instrument with which the Project must comply. The schedule must include:

- nomination of either a PMLU or NUMA for all land within the relevant resource tenures, including land uses for undisturbed land;
- identification of when land becomes available for rehabilitation or improvement;
- rehabilitation or management milestones to achieve the PMLU or NUMA outcomes;
- milestone criteria that demonstrate when each milestone has been completed;
- completion dates for each milestone to be achieved; and
- any conditions considered necessary or desirable.

The administering authority may impose a condition on a draft PRCP schedule or a PRCP schedule if it considers the condition is necessary or desirable (section 4.2 of the PRCP Guideline). Two deemed conditions are to be included in all PRCP schedules in accordance with section 206A of the EP Act. The first condition

states that when carrying out a relevant activity under the PRCP schedule, the holder must comply with a requirement stated in the EA relevant to carrying out the activity.

The second condition states that the holder must comply with the following matters stated in the schedule:

- each rehabilitation milestone and management milestone, and
- when each rehabilitation milestone and management milestone is to be achieved.

2 Background information

The Project is an open cut coal mining operation located in the West Moreton Coalfield in south-east Queensland, approximately 65 km west of Brisbane and 1–2 km north of Rosewood (Figure 1). The Project consists of seven MLs comprising a total area of approximately 995 ha with surface rights to 412 ha (Table 1 and Figure 2). For reference purposes within this PRCP, the site is described as comprising the following three separate rehabilitation planning areas:

1) Oakleigh West

2) Oakleigh East; and

3) Normanton.

NOC acquired the Project in a suspended operational state from the previous owners (Oakleigh Collieries) in December 1999. NOC operations commenced in ML4683 (North Pit) during early 2000 before transitioning to ML4698 (Oakleigh West Pit) in May 2000. Coal production ceased in February 2013, with the last of the coal stockpiled on site removed by April 2013.

Rehabilitation works began once the last of the coal had been mined and have been ongoing since that time. No further coal extraction will occur and the Project is now undergoing final rehabilitation.

Table 1: Mining lease details

Mined area	ML	Grant date	Expiry date	Area (ha)
Oakleigh West	ML50175	21 August 2003	31 March 2025	85.5
	ML4698	27 November 1986	31 March 2025	189.3
Oakleigh East	ML4584	8 March 1978	31 March 2025	161.6
	ML4683	27 February 1986	31 March 2025	173.5
	ML4699	9 August 1984	31 March 2025	129.8
Normanton	ML4675	29 October 1981	31 March 2025	63.5
	ML4568	20 March 1980	31 March 2021	192

2.1 Project description

Underground coal mining operations commenced at Oakleigh East in 1920 and continued until 1997 when the remaining underground coal reserves were deemed uneconomical to mine.

Open cut operations commenced in 1973. The Normanton pit was developed to supply coal to the now defunct power stations of Bulimba and Tennyson and operated until 1981.

The North Pit in Oakleigh East was developed to supplement the underground operations and remained in operation until 1998. Mining of Normanton pit recommenced in 1997 and continued until 1999. Mining of the North Pit recommenced in 2000 for six months until the remaining coal reserves were mined out. The pit was then used as an emplacement area for tailings and coarse reject disposal and was progressively backfilled over the life of the mine.

Figure 1 Project Locality

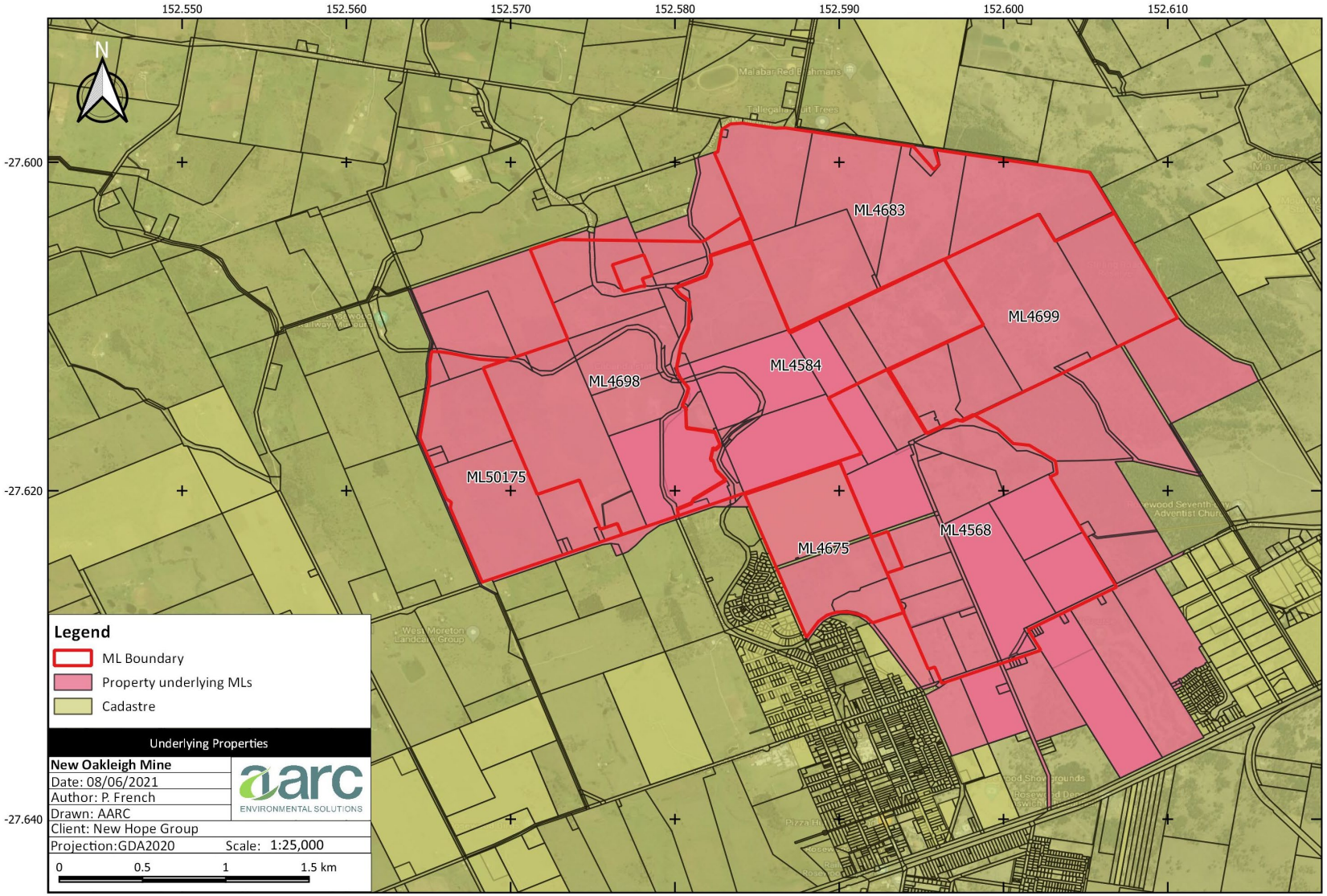

Figure 2: Underlying and surrounding tenement

Surface mining operations in Oakleigh West commenced in May 2000 and continued until February 2013. Oakleigh West was progressively rehabilitated by backfilling with overburden waste material. Much of the Oakleigh West area was recontoured, topsoiled and seeded with pasture species in 2015. The northern section of Oakleigh West was subsequently, and progressively, planted out with native trees to provide some of the native ecosystem PMLU area required by the EA.

During the 1980s and 1990s, Oakleigh Collieries completed progressive reshaping and rehabilitation of mined areas and in-pit and out-of-pit dumps at Oakleigh East and Normanton, with varying degrees of success. Since the cessation of mining activities, extensive rehabilitation work has been undertaken at Oakleigh East and Normanton to infill the remaining voids, remove mine infrastructure and revegetate disturbed areas. No residual voids exist on the site.

Progressive revegetation efforts commenced at Oakleigh East prior to 1997 with the planting of native trees and shrubs in the native ecosystem rehabilitation area. Tailings Dam 1 was sited within the former North Pit at Oakleigh East and was utilised for storage of tailings until 2004. The tailings dams have been capped, with work commencing in December 2018 and completed during 2019.

NOC's rehabilitation activities at Oakleigh East are ongoing, including the installation of drainage structures, slope stabilisation, seeding and revegetation activities. The Normanton pit is now rehabilitated and entering a maintenance and monitoring phase following the recent completion of backfilling, recontouring, topsoiling and seeding activities. Maintenance and monitoring of rehabilitated areas is ongoing.

2.2 Project activities

The most recent version of the Plan of Operations (PoO) covered a three-year period from 1 August 2018 to 31 July 2021. The activities during the PoO period were limited to rehabilitation and closure planning activities. The Project area has been split into three distinct rehabilitation planning areas (Oakleigh West, Oakleigh East and Normanton) as shown in Figure 3. Interim and existing rehabilitation areas are shown in Figure 4. Interim rehabilitation areas are subject to remedial works.

The following Notifiable Activities as listed under Schedule 3 of the EP Act have been conducted at the Project site:

- 24. Mine wastes –
  - (a) storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants;
- 29. Petroleum product or oil storage – storing petroleum products or oil –
  - (b) in above ground tanks with –
    - (iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia – more than 25,000 L capacity.

These sites are registered on the Environmental Management Register, as is the site of an underground fuel tank on the eastern side of the former coal handling and preparation plant (CHPP) area (Oakleigh East). The fuel tank has now been removed.

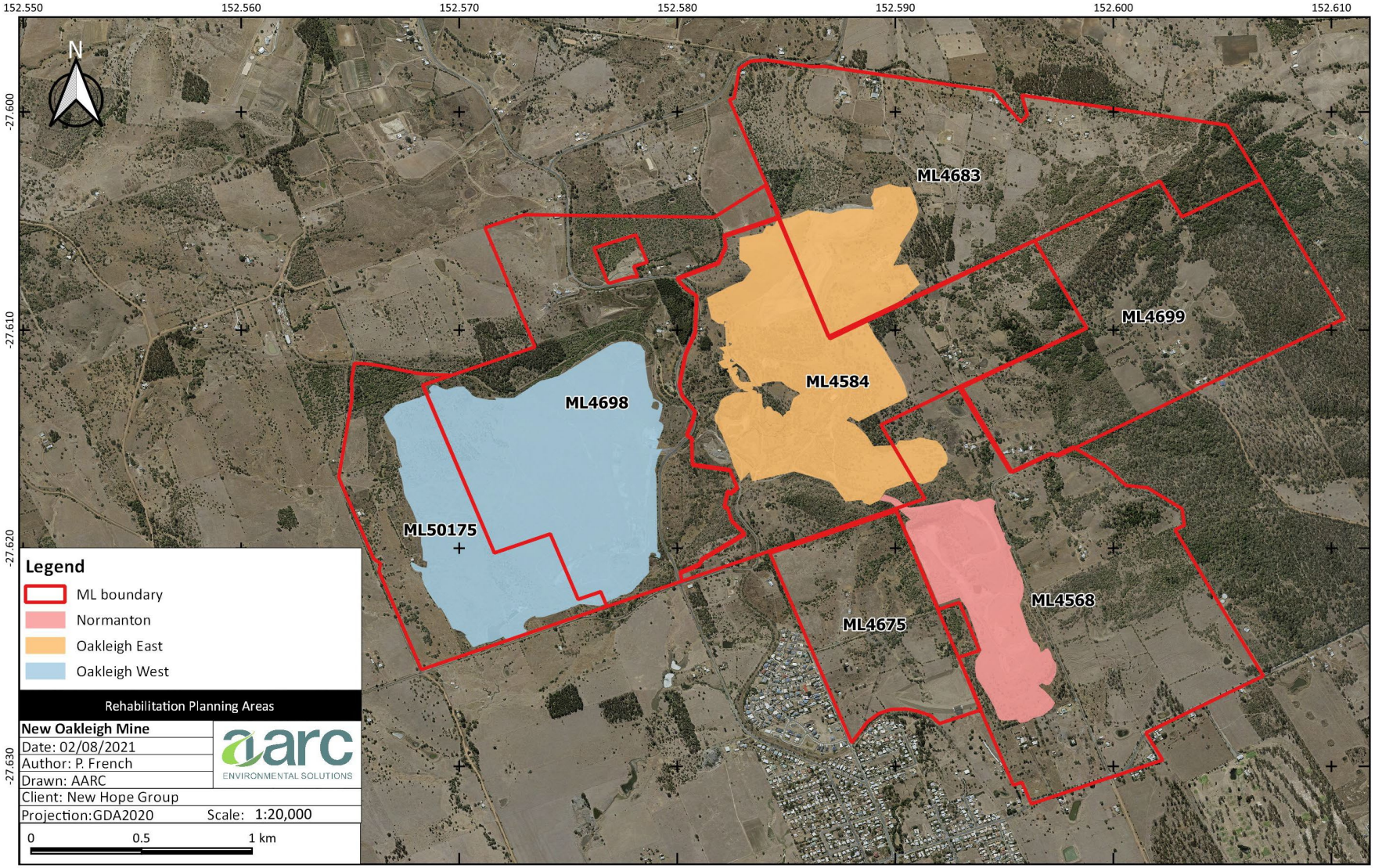

Figure 3: Rehabilitation planning areas

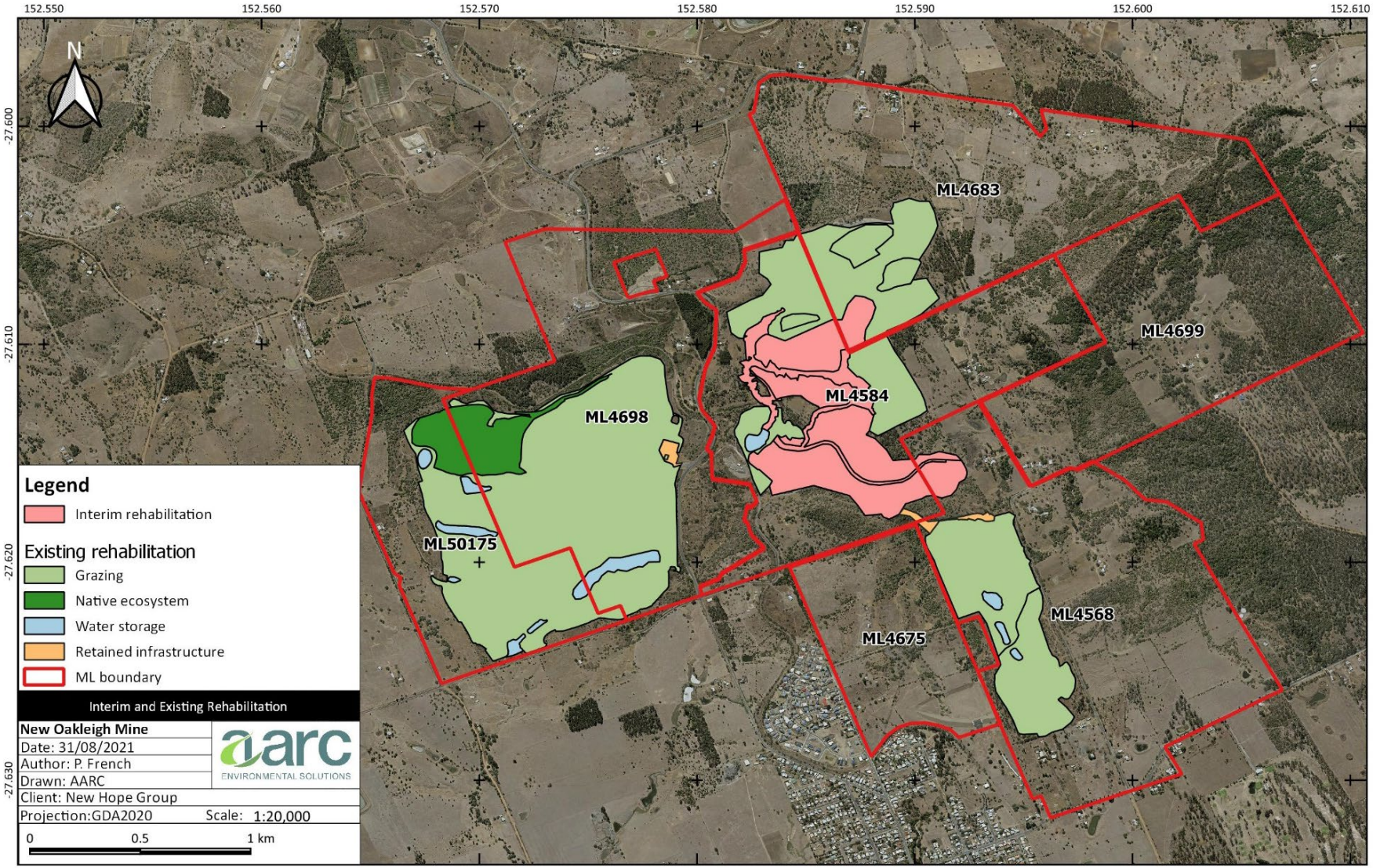

Figure 4: Interim and existing rehabilitation as of August 2021

3 Rehabilitation Planning

3.1 Project planning

3.1.1. Climate

The climate of the Project region is subtropical, with warm to hot, wet summers and cool dry winters (NHCA 2002 [Appendix H]). Climate data is drawn from the Amberley weather station (Station Number: 040004), as it is the closest weather station to the site that has both rainfall and temperature data available. Average temperatures in the region range from 5.4°C–31.2°C (BOM 2021). The average annual rainfall for the area is 852.6mm. Rainfall occurs predominantly in the summer months of December, January and February, which averages approximately 118 mm per month of rainfall (BOM 2021). Potential evaporation in the Rosewood region averages more than two times the expected annual precipitation, which averages approximately 1,700 mm/year (GHD 2012). Figure 5 highlights the significant variation of wet year average rainfall that can occur.

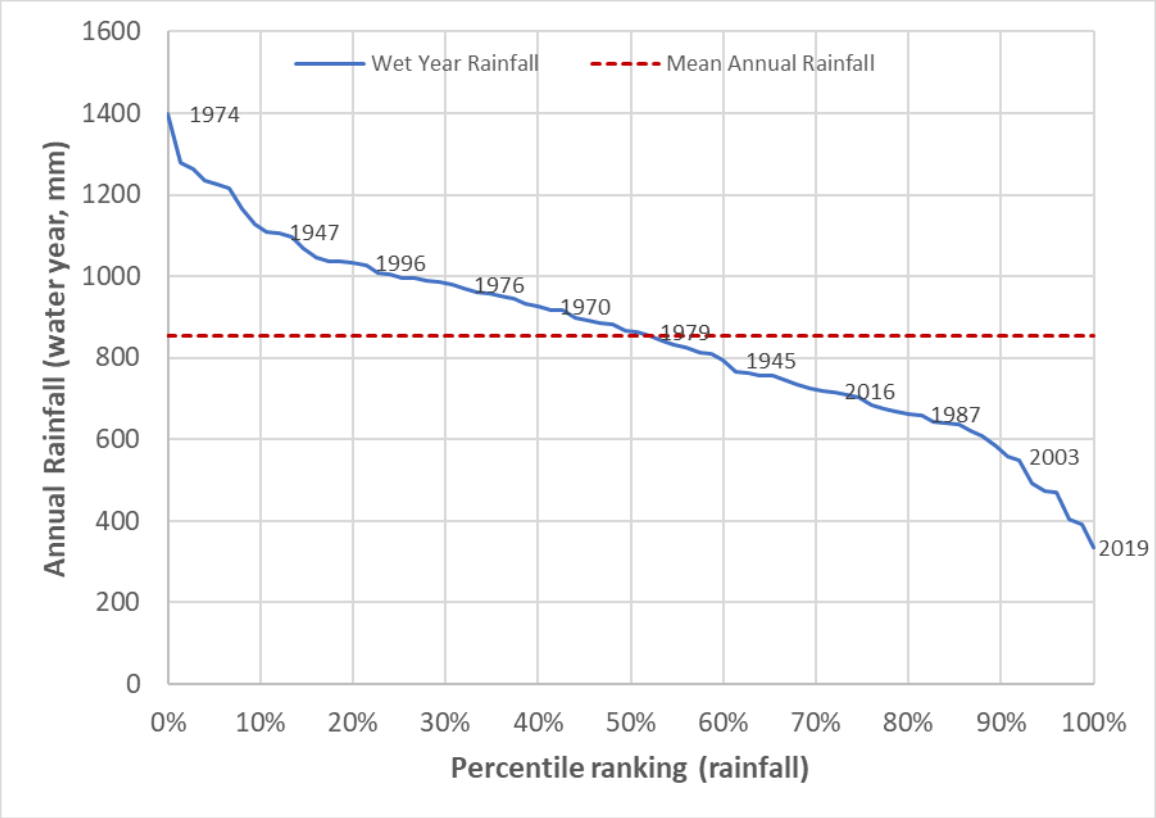

Figure 5: Percentile ranking of wet year data from Amberley Station

Maximum, minimum and average temperatures are projected to continue to rise in south-east Queensland. In 2030, average annual temperatures are projected to rise 0.6°C–1.3°C above 1986–2005 levels and 1.1°C–3.3°C by 2070 (DES 2019). Total rainfall is projected to remain constant or decrease by 2070. However, the intensity of heavy rainfall is considered likely to increase (DES 2019).

3.1.2. Geological setting

The New Oakleigh coal deposit forms part of the lower series of the Walloon Coal Measures, which were deposited during the Jurassic Period (NHCA 2002). The Walloon Coal Measures are characterised by thin coal seams with multiple splits interspersed with layers of clay, shale, siltstone and sandstone. The overburden comprises light grey sandstone and siltstone, with some ironstone beds (NHCA 2002).

The stratigraphy of the Project site is summarised in Table 2.

Table 2: Stratigraphy of New Oakleigh site (GHD 2012)

Geological feature	Description
Walloon Coal Measures	Mudstone, shale, arenite, chert, jasper, metavolcanics, conglomerate
Basalt	Basalt, rhyolite, trachyte
Neranleigh – Fernvale Beds. These units unconformably underlie the Jurassic Ipswich Coal Measures	Mudstone, shale, arenite, chert, jasper, metavolcanics, conglomerate

3.1.3. Topography and surface hydrology

The topography of the Project site and surrounding area is steep and slopes generally to the south. To the north and northeast of Normanton/ Oakleigh East, a ridge with a topographic height of approximately 200 mAHD dominates the local topography, falling southwards to elevations of approximately 50 mAHD within the town of Rosewood and along the Bremer River.

The Project is situated within the Moreton Basin (which drains the area east of Toowoomba into Moreton Bay) and extends to the upper reaches of the Brisbane River to an area north of the New South Wales border. The Project area falls within the Bremer catchment, within which the Bremer River and Warrill Creek are significant water drainage features. The Bremer River catchment area is approximately 2,022 km^2. Warrill Creek confluences with the Bremer River upstream of Ipswich, and the Bremer River confluences with the Brisbane River downstream of Ipswich (Figure 6).

Ephemeral gullies drain stormwater runoff from the site into Western Creek south of the site—a Strahler stream order 4 tributary of the Bremer River (Figure 7). The Bremer River is a perennial river, with occasional flood events resulting in temporary peak flows and water levels. However, no relevant watercourses as defined by section 41C of the Environmental Protection Regulation 2019 exist on site (Figure 7), and therefore, flood plain modelling has not been carried out.

3.1.4. Groundwater

Groundwater within the region of the Project occurs in three different regimes:

1) the Bremer River Alluvium;

2) the Walloon Coal Measures fractured rock (coal seam); and

3) voids within the old mine workings.

Further detail regarding the composition, water quality and flow direction of these aquifers is summarised in Table 3. The information has been obtained from the groundwater study for the Project conducted by Douglas Partners (2004).

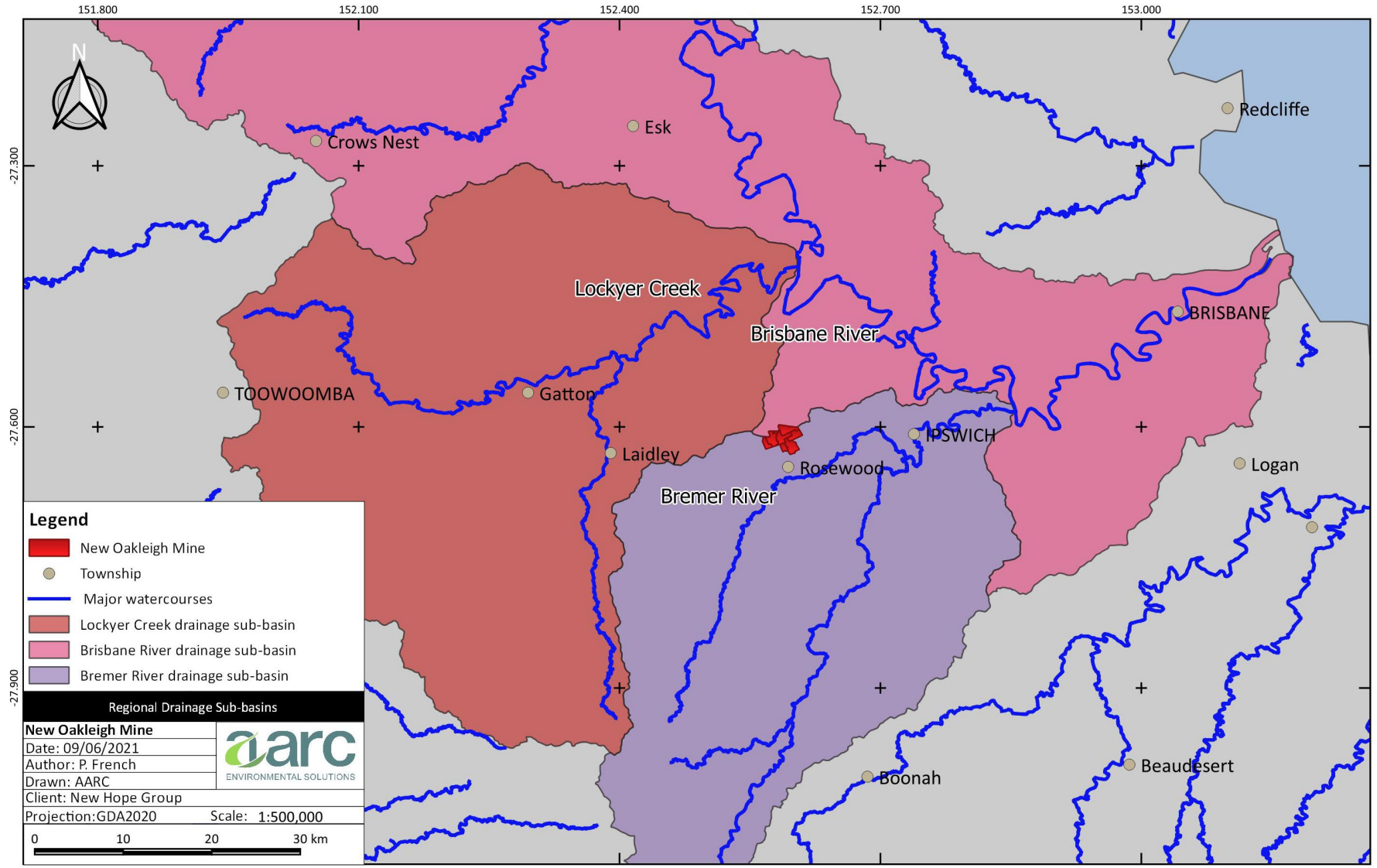

Figure 6: Location of the Project within the Brisbane River and Bremer River sub-basins

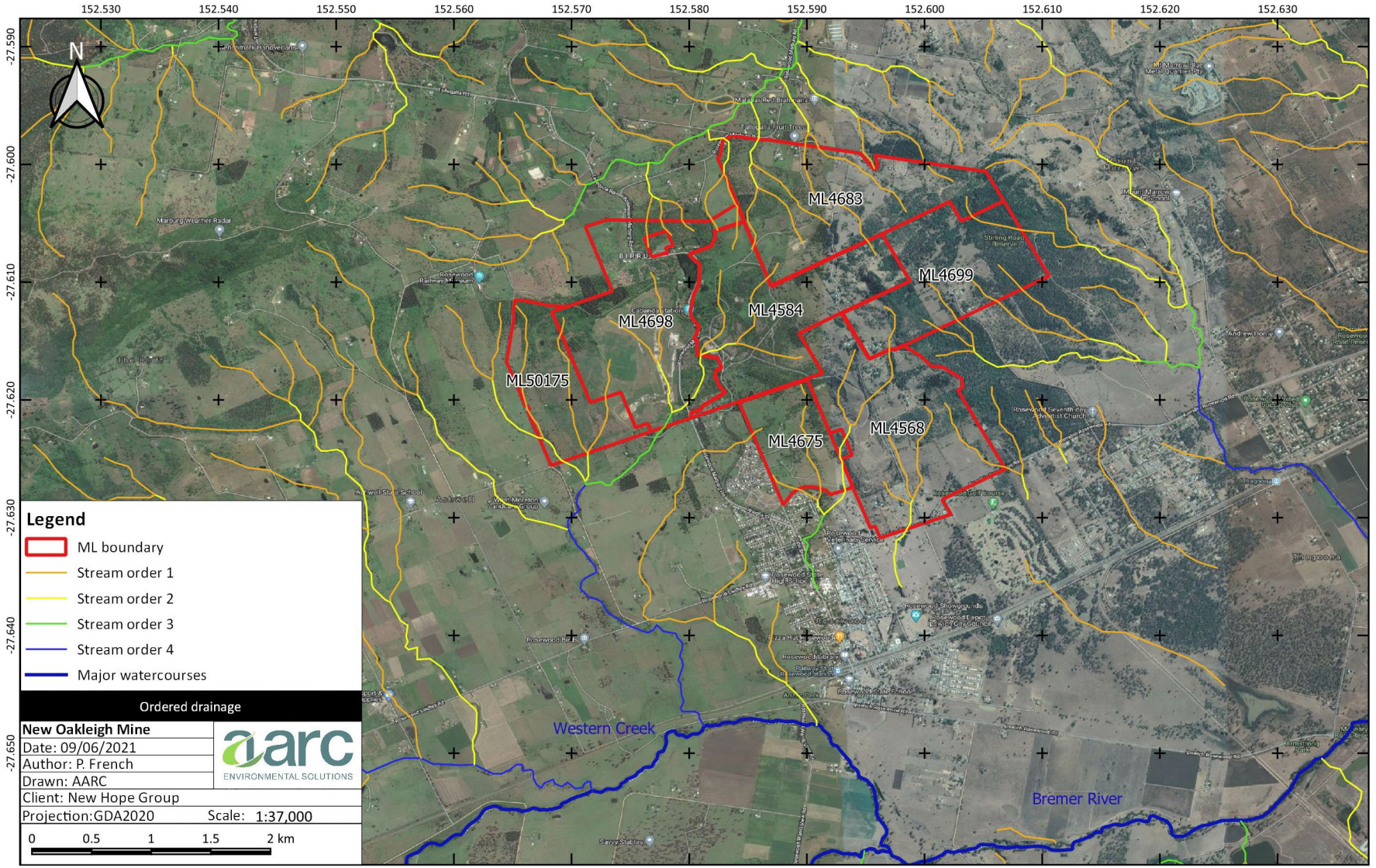

Figure 7: Local watercourses by stream order for the Project area

Table 3: Groundwater regimes within the Project region

Aquifer	Composition	Water quality	Flow direction
Bremer River alluvium	Undifferentiated floodplain and river terrace deposits of sand, silt, gravel and clay.	Brackish with a TDS of approximately 4,500 mg/L (or electrical conductivity (EC) of 7,000 µS/cm). Suitable for most livestock, but not for human consumption.	Likely to reflect the topography of the region and be directed towards the Bremer River.
Walloon Coal Measures fractured rock (coal seam)	Layered sequence of shale, coal, carbonaceous mudstone, siltstone and sandstone. Groundwater is confined by the low permeability siltstone or sandstone present above and below coal seams.	Saline with a TDS of approximately 9,500 mg/L (or EC of 14,500 µS/cm). Not suitable for livestock or human consumption.	Likely to reflect the topography of the region to be directed towards the south from the mine site.
Voids within the old mine workings	Groundwater is confined by the surrounding rock, most likely low permeability siltstone or sandstone.	Brackish to slightly saline with a TDS of approximately 4,000 mg/L (or EC of 6,000 µS/cm). Suitable for most livestock, but not for human consumption.	Likely to reflect the topography of the basement of the voids or the dip direction of the coal seam that was mined.

While groundwater monitoring is not a requirement of the EA, past groundwater studies have collected groundwater level and quality data from a number of bores drilled within and surrounding the Project MLs. The locations of historic groundwater monitoring bores are shown in Figure 8.

The Project site and the surrounding area are not within a 'Proclaimed Area' under the *Water Act 2000*. Original impact assessment work for the Project highlighted that groundwater levels in the Project area are consistent showing a gradient north to south reflecting the surface topography (NHCA 2002).

The drivers for groundwater levels at the Project site are not well understood (GHD 2012). Bores that contain time series data show stable to slightly increasing groundwater levels between 1970 and 1982, following which there is a gap in data collection until 1989. From this date, collection of water level data was limited to a few monitoring bores, which generally show declining groundwater levels from 1989 to 2010 (GHD 2012). This trend is consistent with the steady falling of groundwater levels in the Bremer catchment (Jones 2003).

Groundwater level and quality was monitored monthly from January 2003 to June 2004 at four bores (8377P, 8401P, 8348P and 8348P/8345WB) situated either within ML50175, or within 2 km of the ML boundary (Figure 8). Groundwater levels measured during this short time period recorded variations in response to rainfall and operational groundwater extraction from the historic underground workings. The standing water level for three out of the four bores shows an increasing trend over the sampling period, while bore 8401P shows a declining trend. Bore 8345WB shows the largest variation in standing water level during the period of monitoring. No long-term trends could be established from this dataset. The results indicate groundwater within the fractured rock aquifer within the coal measures is saline, with EC levels ranging between 12,200-15,500 µS/cm. Groundwater pH is slightly acidic to neutral. The current groundwater regime, as defined by monitoring to date and the studies identified above, will fully reflect any impact that may be associated with legacy underground mining in the area.

The voids of historic underground mine workings within the Walloon Coal Measures are likely to represent areas of groundwater sinks—that is, groundwater adjacent to and overlying these voids would flow to these voids. Given the significant extent of the underground mining footprint, the extent of influence these historic workings have on local groundwater flow systems is likely to be significant (GHD 2012).

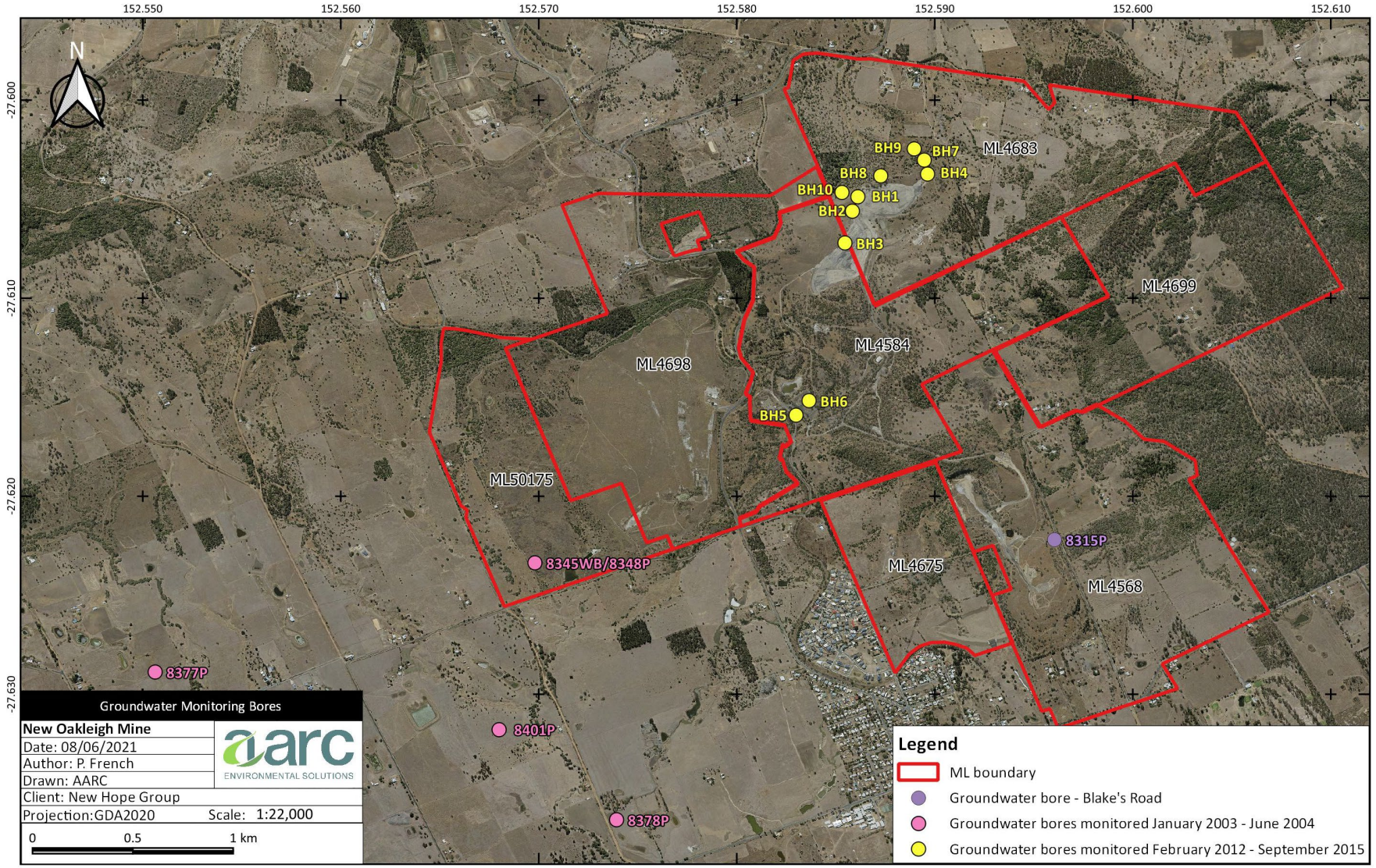

Figure 8: Historic groundwater monitoring bores in the vicinity of the Project

Bore 8378P is screened within the Bremer River alluvium, and the monitoring results indicate the groundwater has a lower TDS content than groundwater within the coal measures, as EC levels varied between 6,540-7,730 µS/cm. The pH of the groundwater is slightly acidic. Based on operational experience including the absence of complaints and community feedback, past mining activities for the Project have not impacted this aquifer. In addition, this aquifer is located well south of the Project at a topographically lower elevation, and therefore, any variation in this aquifer would be more likely to have been influenced over time by the flow status of the Bremer River, climatic conditions (e.g., rainfall events), and localised groundwater use within the aquifer.

Groundwater surface expression has been detected at two locations in the vicinity of the North Pit (Oakleigh East). The first seep was recorded in 2000 and the second was detected in 2006. These springs are known to be brackish, and like other springs in the catchment, represent a source of water for Black Snake Creek and its tributaries (BMT WBM 2013). Despite the completion of several technical studies (AGE 2009; SKM 2012; BMT WBM 2013), the specific processes causing the formation of the two seeps are not well understood. It is however, known that natural springs with a brackish character also occur elsewhere in the catchment of Black Snake Creek (RPS 2011).

A series of bores, representative of all three groundwater regimes (Table 3), were drilled in December 2011 as part of the Oakleigh East groundwater seepage investigation. Groundwater levels were monitored on several occasions between February 2012 and September 2015 at ten bores (BH1 to BH10) situated within ML4584 and ML4683 (Figure 8). There are limited recordings for some bores. BH9 was found to be dry during all sampling events. A decline in standing water level over time was recorded across the other nine bores.

Groundwater quality samples were also obtained from the Oakleigh East bores (BH1–BH10) on two separate occasions during the 2011-2012 wet-season (SKM 2012). EC levels were recorded in the range of 3,590 µS/cm (BH5) to 11,400 µS/cm (BH3) indicating brackish to saline groundwater conditions. pH was found to be acidic to neutral, with values ranging from 4.6 (BH8, April 2012) to 7.2 (BH3, April 2012). Based on the location of the monitoring sites and EC levels, this groundwater is likely from or being influenced by the extensive old underground workings within the Project site.

Another long-term groundwater seep emerges at a topographical low point in the south of Oakleigh West (ML4698) in the vicinity of Urry Road. The seepage water has been found to be saline with total dissolved solids (TDS) concentrations similar to groundwater of the fractured rock aquifer of the Walloon Coal Measures (approximately 9,500 mg/L), which is unsuitable for livestock or human consumption.

Salinity and salt loading in the surface waters of the Black Snake Creek catchment are recognised as most significantly influenced by saline groundwater seeps rising from the Walloon Coal Measures (BMT WBM 2013 RPS 2011; Volders *et al*. 2014). The periodic presence of saline water in seepage influenced areas, such as the Urry Road dam and North Pit seeps, is consistent with known water quality in the Black Snake Creek catchment as discussed further in section 3.5.7. A groundwater investigation study was completed in 2004 to satisfy requirements of Land Court proceedings in relation to ML50175. Given that this study failed to identify any issues of concern, the then administering authority removed conditions relating to groundwater from the Project EA.

In summary, groundwater is not a significant resource for the local area surrounding the Project. This fact is supported by the generally poor to very poor quality of the three recognised local aquifers, the lack of intensive agriculture around the Project site, and the lack of groundwater status for the area under the *Water Act 2000*.

3.1.5. Land and soil

3.1.5.1 Pre-mining land use and underlying landholders

Prior to the commencement of mining, the Project area was extensively cleared by past land use practices and now supports rural residential development, small scale grazing, small patches of native regrowth and a remnant stand of native vegetation (‘Rosewood Scrub’) (NHCA 2002). New Hope owns all freehold land affected by surface mining.

3.1.5.2 Land capability and stability

A pre-mining land capability assessment was carried out by Ison Environmental Planners (Ison 1998a in NHCA 2002), with the findings summarised in Table 4. Land capability classes were assigned based on the land capability classification system developed by Rosser *et al.* (1974).

Table 4: Pre-mining land capability assessment of the Project

Class	Description	Area (ha)	Per cent of total area
I	Land suited to a wide range of agricultural crops and is highly productive. It presents no limitations to the use of machinery or choice of implements. Both wind and water erosion hazard are low	0	0%
II	Land suitable for agricultural use with moderate to severe restrictions	0	0%
III		167.6	40.9%
IV	Land primarily suited to pastoral use, but which may be safely used for occasional cultivation with careful management	0	0%
V	Land which has limitations that, unless removed, make cultivation impractical and/or uneconomic. Such limitations include rocks or stones, gilgai (melon hole) microrelief, wetness or waterlogging or subject to regular flooding	0	0%
VI	Land which is not suitable for cultivation but is well suited to pastoral use and on which pasture improvement involving the use of machinery is practicable	41.5	10.1%
VII	Land which is not suitable for cultivation but on which pastoral use is possible only with careful management; pasture improvement involving the use of machinery is not practicable	148.5	36.2%
VIII	Land with limitations that would preclude its use for any form of agriculture	52.7	12.8%
Total		410.3	100%

The natural topography of the Project area ranges from moderate to steep slopes. For the rehabilitated landform to blend into the existing topography some shorter, steeper slopes are necessary. This requirement is reflected in the EA through condition F5 and Table 2 of schedule F which allow for short, steep slopes of up to 40% over limited areas. Further information regarding final landform design is detailed in Section 3.5.4.

3.1.5.3 Soil characteristics

A number of pre-mining soil surveys of each of the Project rehabilitation planning areas have been undertaken. From these surveys, sufficient information was obtained to characterise the soils, identify the properties of the various soil horizons and identify recoverable topsoil resources; which have been used within the rehabilitation programs carried out to date.

Between 2011 and 2013, topsoil and subsoil samples were taken from 12 sites at Oakleigh West, Oakleigh East and Normanton for landform design purposes (Landloch 2013). The locations of these sampling points are shown in Figure 9. Laboratory analyses show that soil pH was neutral to alkaline for all samples. EC was generally low and at levels unlikely to inhibit plant growth, and exchangeable sodium was generally low, though both samples from Oakleigh West (sample OW01 and OW02) had levels of sodium that indicated the soils were bordering on sodic.

Across all three areas, topsoil clay contents were similar (approximately 30%). There was slightly greater variation in proportions of fine and coarse sand across the Project rehabilitation planning areas. The Oakleigh

West samples showed significantly higher levels of fine sand than samples from the other two areas (Oakleigh East and Normanton), indicating higher erodibility than topsoils from the other two areas.

Another soil survey was conducted during 2019 for the Oakleigh East and Normanton areas, and included an additional sample from Oakleigh West. The locations of these sampling points are shown in Figure 9. Laboratory analyses showed high similarity to the survey results obtained during 2011 and 2013 and reported in Landloch (2013).

Overall, the soil survey results from across the Project area, as well as the results of rehabilitation undertaken to date, confirm that there are no substantive deficiencies with respect to topsoil quality.

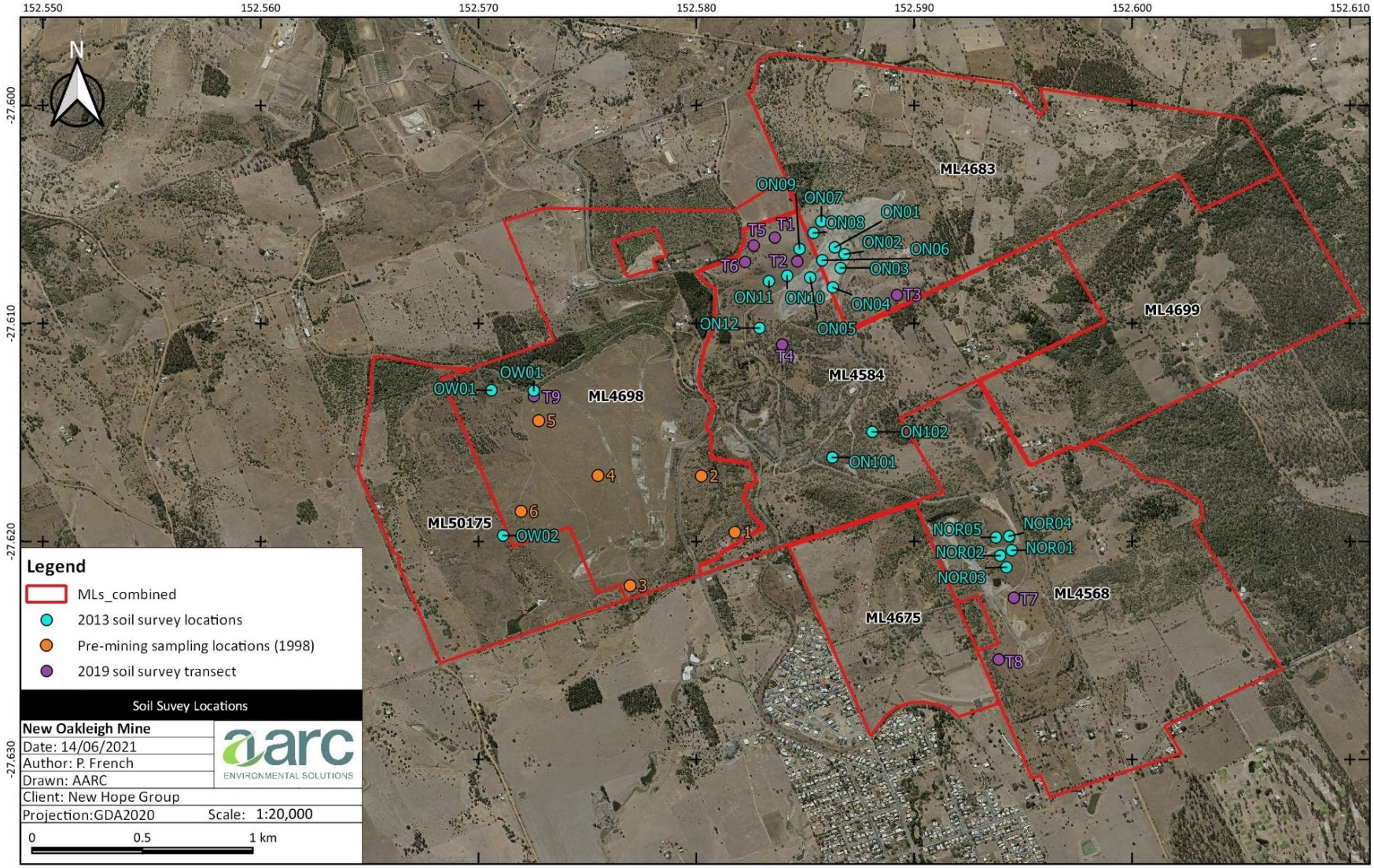

Figure 9: Soil sampling locations at the Project site area

3.1.6. Flora and fauna

3.1.6.1 Pre-mining vegetation

Prior to the commencement of mining, the Project area had been extensively cleared for past land use practices. Only two areas of significant tree cover remain; both situated on land north of the railway line on ML4698, where no surface disturbance has occurred. The remainder of the Project site has only occasional small trees or shrubs scattered across grazing paddocks. These trees and shrubs were predominantly Sally Wattle (*Acacia salicina*) and Black Teatree (*Melaleuca bracteata*). Grasses were predominantly exotic species, with Blue couch (*Digitaria didactyla*), Rhodes grass (*Chloris gayana*) and Green panic (*Megathyrsus maximus*) being the most common. Also present were several weed species typical of overgrazed pastures.

The forested patch in the northeast of Oakleigh West is a plantation plot of Hoop Pine. North of the railway line in ML4698 is a small remnant patch of endangered regional ecosystem (RE) of *Acacia harpophylla* open forest; mapped as an area of approximately 5 ha within the ML. A total of 36 species from 31 genera representing 15 families were identified in this community. The canopy is reported to have been broken and exotic weeds are present. No mining occurred in this area. This RE has been extensively cleared with approximately 2% of the original extent of this vegetation type remaining (Healthy Land & Water 2017).

At the time of flora surveys being undertaken, no plants observed within the ML4698 were listed as rare or threatened. The near threatened species *Callitris baileyi* was found on some of the nearby slopes with the same aspect and may have originally been present on the Project site.

A desktop search of the Project area identified several REs that were present pre-clearing. These REs are listed in Table 5 and their pre-clearing distributions are shown in Figure 10.

Table 5: Pre-mining vegetation communities

Regional Ecosystem	Short Description
12.9-10.6/ 12.9-10.2	*Acacia harpophylla* open forest on sedimentary rocks/ *Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks
12.3.3d	*Eucalyptus tereticornis* woodland on Quaternary alluvium
12.8.23/ 12.8.13	*Acacia harpophylla* open forest on Cainozoic igneous rocks/ Araucarian complex microphyll vine forest on Cainozoic igneous rocks
12.8.16	*Eucalyptus crebra* +/- *E. melliodora*, *E. tereticornis* woodland on Cainozoic igneous rocks
12.3.10a	*Eucalyptus populnea* woodland on alluvial plains
12.8.13	Araucarian complex microphyll vine forest on Cainozoic igneous rocks

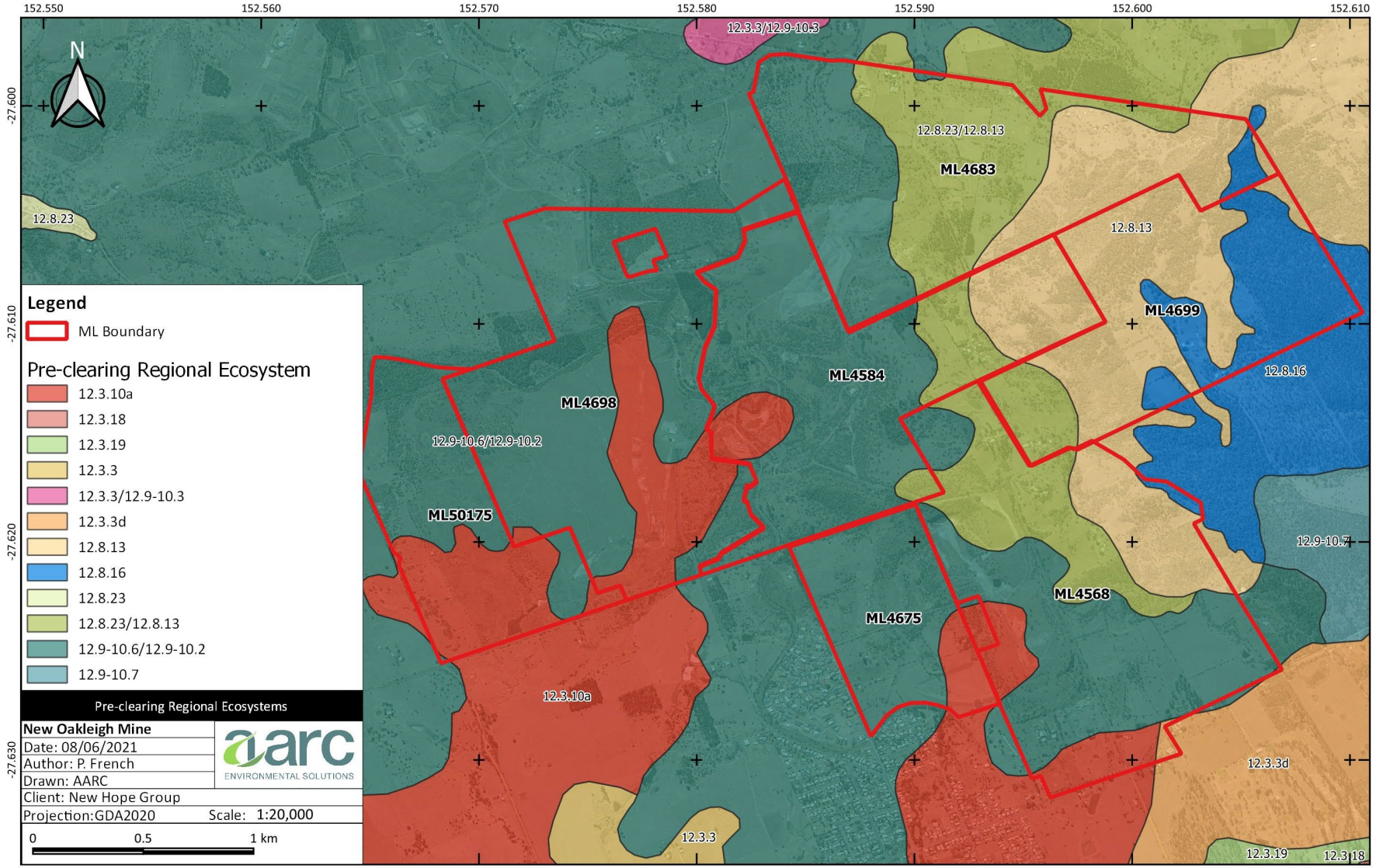

Figure 10: Pre-clearing regional ecosystem map

3.1.6.2 Remnant vegetation

A desktop search of the Version 10.0 Queensland Government Vegetation management regional ecosystem mapping (DES 2021) identified five REs on the Project site; listed in Table 6. The distribution of each RE is shown in Figure 11.

The distributions of Endangered REs (RE 12.9-10.6 and RE 12.8.23/12.8.13) within the Project site are highly restricted. The remnant patch of Brigalow open forest (RE 12.9-10.6) remains to the north of the railway line at Oakleigh West. This patch has been retained throughout the period of mining but is subject to invasion by weed species, particularly those known to impact this RE (e.g., *Asparagus africanus*).

Table 6: Remnant regional ecosystems

Regional Ecosystem	Short Description	Conservation Status (VM Act)
12.9-10.6	*Acacia harpophylla* open forest on sedimentary rocks	Endangered
12.8.23/ 12.8.13	*Acacia harpophylla* open forest on Cainozoic igneous rocks/ Araucarian complex microphyll vine forest on Cainozoic igneous rocks	Endangered / Of concern
12.8.16	*Eucalyptus crebra* +/- *E. melliodora*, *E. tereticornis* woodland on Cainozoic igneous rocks	Of concern
12.8.13	Araucarian complex microphyll vine forest on Cainozoic igneous rocks	Of concern

3.1.6.3 Fauna observations

A pre-mining fauna assessment was undertaken in 1998 (Ison 1998b). The assessment was conducted for the Oakleigh West pit development but also covered other parts of the Project area. Fauna surveys were conducted during periodic visits to the Project area, and early evening surveys were conducted on four occasions. The fauna species inventory compiled following the completion of field surveys is provided in Table 7.

Due to historical clearing at the Project area, the disturbance of the original vegetation left little to no suitable habitat for woodland birds and native mammals. Most of the fauna species recorded on site were birds, with the Torresian crow (*Corvus orru*), Australian magpie (*Gymnorhina tibicen*) and Crested pigeon (*Ocyphaps lophotes*) occurring most commonly. There was a noticeable absence of bushland birds, likely attributable to the lack of suitable habitat. No native mammals were recorded during the fauna studies on site. This finding was considered likely to be a result of the lack of suitable habitat and predation by cats and foxes. Some bats were sighted over the survey area, but there were no suitable roost sites identified. The frogs and reptiles sighted were all common in farmland and around farm dams. Overall, the lack of bushland habitat was deemed a restriction on faunal diversity at Oakleigh West and other parts of the Project site.

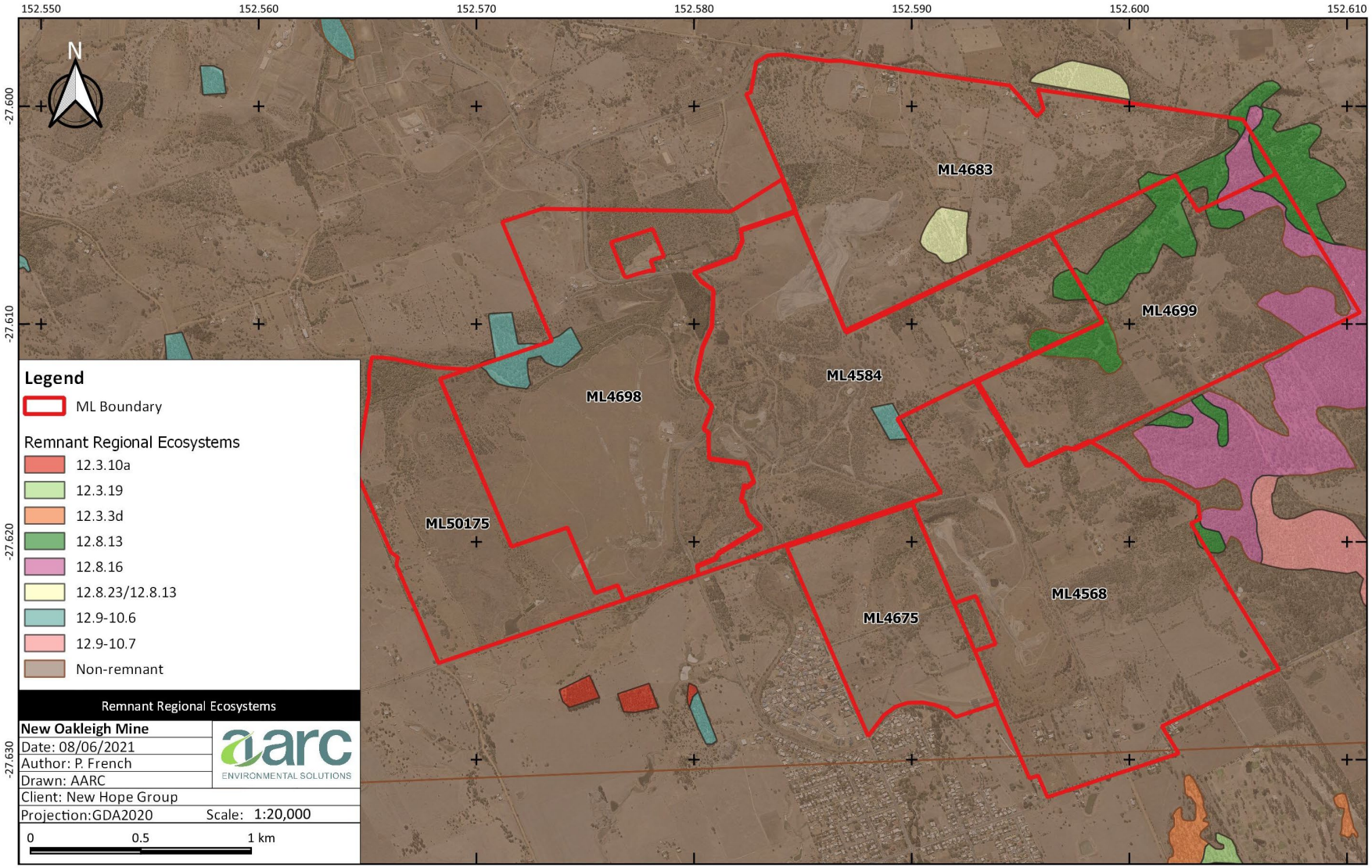

Figure 11: Remnant vegetation cover at the Project site (DES 2021)

Table 7: Fauna species found on the Project site

Family	Scientific Name	Common Name
Amphibians		
Hylidae	*Litoria caerulea*	Common Green Treefrog
Hylidae	*Litoria fallax*	Eastern Sedgefrog
Hylidae	*Litoria rubella*	Ruddy Treefrog
Bufonidae	*Rhinella marina* *	Cane Toad
Reptiles		
Scincidae	*Cryptoblepharus virgatus*	Striped Snake-eyed Skink
Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue
Agamidae	*Pogona barbata*	Bearded Dragon
Boidae	*Morelia spilota*	Carpet Python
Elapidae	*Pseudonaja textilis*	Eastern Brown Snake
Birds		
Anatidae	*Anas superciliosa*	Pacific Black Duck
Anatidae	*Chenonetta jubata*	Australian Wood Duck
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis
Ardeidae	*Bubulcus ibis*	Cattle Egret
Ardeidae	*Egretta novaehollandiae*	White-faced Heron
Falconidae	*Falco cenchroides*	Nankeen Kestrel
Accipitridae	*Elanus axillaris*	Black-shouldered Kite
Charadriidae	*Vanellus miles*	Masked Lapwing
Columbidae	*Ocyphaps lophotes*	Crested Pigeon
Psittacidae	*Eolophus roseicapilla*	Galah
Psittacidae	*Platycercus adscitus*	Eastern Rosella
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra
Maluridae	*Malurus melanocephalus*	Red-backed Fairy-wren
Meliphagidae	*Manorina melanocephala*	Noisy Miner
Dicruidae	*Grallina cyanoleuca*	Magpie-lark
Dicruidae	*Rhipidura leucophrys*	Willie Wagtail
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird
Artamidae	*Gymnorhina tibicen*	Australian Magpie

Family	Scientific Name	Common Name
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
Corvidae	*Corvus orru*	Torresian Crow
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird
Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch
Estrildidae	*Taeniopygia guttata*	Zebra Finch
Hirundinidae	*Hirundo neoxena*	Welcome Swallow
Hirundinidae	*Petrochelidion nigricans*	Tree Martin
Hirundinidae	**Acridotheres tristis*	Common Myna
Sylviidae	*Cisticola exilis*	Golden-headed Cisticola
Mammals		
Muridae	*Rattus rattus**	Black Rat
Muridae	*Mus musculus**	House Mouse
Canidae	*Vulpes vulpes**	Red Fox
Felidae	*Felis catus**	Cat
Leporidae	*Lepus europaeus**	European Brown Hare

*Note: * Indicates an introduced species*

3.2 Community consultation and stakeholder engagement

For the period that the Project was operational, the NOC team maintained a strategy of open communication with the community, including hosting community meetings to provide input into environmental and operational performance and address rehabilitation objectives and progress at the Project site.

Throughout the life of the Project, many NOC employees have been members of the local community and involved in community activities, fundraisers and volunteering. New Hope has actively supported the region by investing time and money to support community organisations such as sporting clubs, regional industry associations, charities and festivals and events.

3.2.1. Existing stakeholder and community consultation plan

NOC currently operates under a Stakeholder Engagement Plan (SEP) (Appendix E) specifically developed for the New Oakleigh Mine Closure Project and that meets the requirements of section 126C(1)(c)(iv) of the EP Act, as well as the PRCP Guideline. The plan describes the stakeholder engagement process, engagement objectives, and how feedback is managed. A stakeholder analysis has also been undertaken to identify and categorise stakeholders by their level of influence and level of interest in and/or concern about the Project.

The SEP was developed to be a practical tool for effective stakeholder engagement on rehabilitation and closure matters and establishes the engagement objectives described in Table 8.

Community engagement has been undertaken primarily through Community Consultation and Awareness Program (CCAP) meetings, with additional communication materials released as required. The community has been updated on matters including rehabilitation and management methods, progressive rehabilitation and closure timeframes. In the CCAP meetings, community members have had the opportunity to raise

issues and make comments on all aspects related to the Project. Details of community consultation activities have been recorded in a stakeholder engagement database.

New Hope is committed to actively addressing matters identified through the consultation process. A notable issue raised by the community related to the final voids that were approved to be retained under the EA. New Hope's response to this community concern has resulted in all voids being infilled, resulting in an improved environmental and social outcome than stipulated by the EA. A similar example related to a rehabilitated spoil dump at Normanton, which has since been removed and used to backfill the Normanton void with the objective of restoring and/or improving views from neighbouring properties.

Table 8: Stakeholder engagement objectives

Objective	Description
Operate an open and transparent engagement process.	The stakeholder engagement methodology adopts an open and transparent approach to informing stakeholders of the objectives and activities for the Project.
Be responsive to stakeholders.	Stakeholder ideas, issues and opportunities are to be identified and documented through established communication channels and face-to-face consultation. All contact will be managed via a stakeholder contact database. This approach will involve an open, two–way process. NOC will acknowledge receipt of stakeholder feedback and 'close the loop' with stakeholders at the end of a consultation period by informing them as to how their input has been considered.
Disseminate information in a timely manner.	Information is to be disseminated taking into account the time stakeholders will need to understand it and respond appropriately. Information dissemination will be timely in order to manage any misinformation or rumours that may arise.
Remain accountable to stakeholders.	NOC will demonstrate integrity and be accountable to stakeholders during engagement processes and commitments will be made in good faith. Accountability will occur through the reporting of outcomes, periodic evaluation of the engagement process and the achievement of objectives.

3.2.2. Historical stakeholder and community engagement

The New Oakleigh CCAP was established as an outcome of the mining lease application for ML50175. The first community consultation event was held in 2001, primarily to help facilitate the ML application (ML 50175) to extend the Oakleigh West mining area and as a response to concerns raised by the Rosewood District Protection Organisation (RDPO). Meetings were held throughout 2003 and 2004 with the RDPO and representatives of Ipswich City Council. This consultation phase ceased in early 2005.

A new format for community meetings was established in February 2006. Meetings were held quarterly until late 2007 when they were changed to a six-monthly frequency. Additional community groups and the then Environmental Protection Agency (EPA) were invited to attend. Groups that were invited and attended at least one meeting have included:

- EPA;
- RDPO;
- Ipswich City Council;
- West Moreton Landcare;
- Rosewood High School;
- Ashwell State School;
- Rosewood Ambulance;
- Moreton Border News;
- Rosewood Chamber of Commerce;
- Cabanda Aged Care;
- Community Bank; and
- Society for Growing Australian Plants.

Between 2006 and 2008, a variety of issues have been raised regarding rehabilitation and closure planning, including void parameters and dimensions and rehabilitation matters generally, including rehabilitation of 'Rosewood Scrub' areas.

3.2.3. Stakeholder and community consultation register

NOC was actively engaged with the community prior to the implementation of the PRCP legislation in 2019 and has demonstrated that many of the issues raised in consultation meetings have been considered in rehabilitation planning. Consultation activities were undertaken in accordance with a Stakeholder Engagement Plan (refer Appendix E) which was developed during the early planning stages for closure of the site. CCAP meetings were the primary means for community consultation and were held until September 2017 when the format was changed following declining attendance. The consultation format then moved to open, monthly, drop-in sessions.

The Stakeholder Engagement Plan is included at Appendix E, however it should be noted that, given the advanced stage of rehabilitation at the site, any future consultation falls within Phase 3 of the plan and will be limited to actions such as responding to stakeholder inquiries and providing information on rehabilitation progress as deemed appropriate.

A register of community consultation activities since commencement of the SEP in 2011 is provided at Appendix F.

3.3 Post-mining land use

3.3.1. Land outcome document(s)

The Project EA was re-issued on 23 January 2015 (originally issued 2001) to authorise mining activities at Oakleigh West. Schedule F of the EA relates to land management requirements with condition F1 and Schedule F – Table 1 (titled Final Land Use and Rehabilitation Approval Schedule) identifying final land uses for the Project – refer Table 9. It is considered that the EA meets the requirements of a land outcome document (LOD) as defined by section 750 of the EP Act. No other LODs have been identified for the Project.

It is important to note that the EA, while applicable to ERA 13 mining activities on all MLs, was issued primarily to authorise mining activities in Oakleigh West, and therefore, Schedule F – Table 1 does not reflect the full and current extent of disturbance at the Project site. In particular, the following discrepancies should be noted:

- there is no reference to existing tailings storage facilities in Oakleigh East—now rehabilitated—or other historic infrastructure areas;
- the disturbance type nominated as 'void' is no longer applicable as the ML50175 void has since been backfilled and rehabilitated; and
- there are inconsistencies between some of the specified disturbance areas and the actual areas of land disturbed.

The discrepancies evident in the EA are understood to be due to the 2015 EA amendment being focused on regulation of the Oakleigh West extension, and not the Oakleigh East and Normanton rehabilitation planning areas. The EA also significantly pre-dates the PMLU and LOD definitions and other vernacular introduced under the recent PRCP provisions of the EP Act. For each of the discrepancies noted, the PMLUs proposed under this PRCP are included within the post-mine land descriptions provided by Schedule F – Table 1 of the EA. Section 755B of the EP Act specifies an exemption of the notification requirements for a proposed PRCP schedule where:

> *The outcome for land under a land outcome document is the same as, or substantially similar to, the post-mining land use or non-use management area stated for the area under the proposed PRCP schedule.*

The inclusion of the correct rehabilitation areas for PMLUs in this transitional PRCP is considered to be substantially similar to the EA post-mine land descriptions. The differences between the new proposed PMLUs and the LOD are discussed in the following sections.

By virtue of the existence of a LOD, and in accordance with section 213 of the Environmental Protection Regulation 2019, Schedule 8A, part 3, Table 1 *Final site design assessment* and Table 2 *Post-mining land use assessment – rehabilitation milestones*, do not apply to the objective assessment to be undertaken for this PRCP.

In relation to the *Progressive Rehabilitation* component of Table 2, this PRCP will:

- describe how rehabilitation areas are planned in a way that achieves progressive rehabilitation;
- illustrate how progressive rehabilitation has already commenced at the Project site;
- identify risks and discuss their incorporation within, and their impact on, the milestone schedule; and
- describe community consultation approaches appropriate for the Project.

3.3.2. Pre-mining land use

Historically, land uses surrounding the Project site consisted predominantly of agriculture and cattle grazing (Telfer *et al*. 1998). Other important land uses identified in the Bremer River catchment at the time included mining, quarrying, rural residential and urban developments, State Forest and recreation and nature reserves.

At the time of the commencement of mining by NOC in 2000, the Project area had been extensively cleared by past land use practices (mining and grazing) with remaining land uses including rural residential development, small scale grazing, small patches of native regrowth and a remnant stand of native vegetation ('Rosewood Scrub').

The Project site holds a rich history of mining undertaken prior to the acquisition by NOC of the mine in December 1999. Underground mining commenced at the Project site in 1920 and continued through until November 1997 when the underground resource was economically exhausted. Open cut operations commenced in 1973 in the south-east corner of ML4584 (Oakleigh East) and progressed in a northerly direction. Known as the North Pit, the pit remained in operation until 1998. Mining of the Normanton pit commenced on the eastern side of Blakes Road in 1973, progressing westward across Blakes Road and eventually extending northwards until the cessation of operations in approximately 1981. Mining at Normanton recommenced from June 1997 until December 1999.

A geotechnical assessment of part of ML4584 and ML4699 (largely coincidental with the Oakleigh East rehabilitation planning area) was undertaken in 2012 (Moreton Geotechnical Services 2012) and concluded that any regional subsidence (estimated to be up to 900 mm) will have occurred by about 2000 and that the formation of potentially hazardous features such as sinkholes and tunnel or shaft entries are not anticipated or known on this site. In 2013, Moreton Geotechnical Services Pty Ltd assessed the extent of tunnels and shafts across the ML areas held by New Hope and identified fourteen features (tunnels and shafts) for which New Hope were considered to have a rehabilitation obligation, with a number of these requiring remedial works to make safe which was subsequently completed.

There is no evidence that, regionally, legacy underground mining operations have impacted the ability to undertake existing and post-mining land uses either on the Project site or neighbouring properties.

3.3.3. Existing local land use

A review of Queensland land use mapping indicates that lands surrounding the Project consist predominantly of grazing lands with pockets of residential land occurring in association with nearby townships. Irrigated pasture and cropping lands also occur to the south-west of the Project site. The footprint of disturbance for the Oakleigh West void is demarcated as mining land.

The Project area lies wholly within the Ipswich City Council local government area and is subject to the provisions of the Ipswich Planning Scheme 2006. Lands underlying the Project site are zoned as Rural; predominantly classified as pastoral lands with a portion of agricultural land in the south-west of ML 50175 (Oakleigh West).

The Ipswich Planning Scheme 2006 identifies the overall outcomes as the purpose of the Rural Areas Code.

The overall outcomes sought for the Rural A (Agricultural) Zone are cited as:

a) *The Rural A (Agricultural) Zone protects good quality agricultural land and caters for both traditional and new and emerging agricultural activities, including commercial cropping, forage, plant nurseries, cut flowers and farm forestry, to the general exclusion of most other uses.*

b) *Uses within the Rural A (Agricultural) Zone are provided with basic levels of service which reflect their rural location and character.*

c) *Uses and works within the Rural A (Agricultural) Zone are located, designed and managed to—*

   i) *maintain the agricultural use of the land;*

   ii) *be compatible with surrounding uses and works;*

   iii) *protect the character of the nearby area;*

   iv) *maintain rural amenity;*

   v) *maintain the safety of people, buildings and works;*

   vi) *avoid significant adverse effects on the natural environment; and*

   vii) *avoid the establishment of non-rural type uses such as urban residential uses.*

The overall outcomes sought for the Rural B (Pastoral) Zone are cited as:

a) *The Rural B (Pastoral) Zone caters primarily for commercial pastoral activities, forestry or other sustainable rural activities (including both traditional and new and emerging rural activities such as wineries, nurseries, wholesale plants, shrubs and cut flower suppliers) although some lands may be suitable for rural support activities.*

b) *The Rural B (Pastoral) Zone also caters for rural based tourism and recreational activities, including provision of accommodation and support services for eco-tourism within nearby rural conservation areas.*

c) *Uses within the Rural B (Pastoral) Zone are provided with basic levels of service which reflect their rural location and character.*

d) *Uses and works within the Rural B (Pastoral) Zone are located, designed and managed to—*

   i) *maintain the productive use of the land;*

   ii) *be compatible with surrounding uses and works, in particular where adjacent to closely settled areas or the Rural C (Rural Living) Zone or within water supply catchment areas;*

   iii) *protect the character of the nearby area;*

   iv) *maintain rural amenity;*

v) *maintain the distinct 'greenbelt' between the urban areas and townships which contributes significantly to the rural landscape character and the 'sense of community' for the towns, villages and urban areas;*

vi) *maintain the safety of people, buildings and works; and*

vii) *avoid significant adverse effects on the natural environment*

Under the *Regional Planning Interests Act 2014* (Qld) and the South East Queensland Regional Plan 2009-2031, the Project area is largely mapped as a Priority Living Area (PLA) while portions of land occurring in the south-west of ML50175 (Oakleigh West) and the south of ML4568 (Normanton) are identified as Strategic Cropping Land. PLAs are urban centres and towns generally with a population of greater than 200.

3.3.4. Prescribed post-mining land use

In accordance with Condition F1 of the resource activity EA:

> *All areas significantly disturbed by mining activities must be rehabilitated to the final land description as defined in Schedule F–Table 1 and as shown in figure 5 of the project Environmental Management Overview Strategy (EMOS).*

Schedule F – Table 1 of the EA and figure 5 of the EMOS have been reproduced here as Table 9 and Figure 12.

Table 9 and Figure 12 together describe the PMLUs for the Project, which include 'grazing', 'native ecosystem' and 'sediment and water supply dams'. In addition, Table 9 and Figure 12 together also describe a single NUMA for the Project in the form of a 'residual void' on ML50175 (Oakleigh West), which has been backfilled and rehabilitated by NOC since the original identification of PMLUs within the EA.

Table 9: Post-mining land use (EA Schedule F Appendix 1)

Tenure ID	Disturbance type	Disturbance area	Post-mine land description	Post mine land capability classification	Analogue site identification
ML50175	Void	19	Residual void	VIII	n/a
All tenures	Recontoured spoil	361	Grazing	III-VIII	Lot 566 on CH3 1740
		30	Native ecosystem	VIII	Refer condition F3– 2
All tenures	Sediment and water supply dams	2	Sediment and water supply dams	VIII	n/a

3.3.5. Proposed post-mining land use

Given the discrepancies identified in section 3.3.1, and to provide improved outcomes for the rehabilitation of the Project site (refer section 3.5.4), the LOD PMLUs have been reviewed and areas recalculated, and for the purposes of this PRCP are proposed as described in Table 10 and Figure 13. The proposed PMLUs are detailed further in the PRCP schedule provided at Appendix A and Appendix C, and in the Final Site Design Map at Appendix B. The existing/future land use of undisturbed areas within the resource tenure boundary is

stated as the current land use as per the Queensland Land use Mapping Program (State of Queensland [DES] 2020).

Table 10: Proposed post-mining land uses

Tenure ID	Disturbance type	Disturbance area	Post-mine land use	Post mine land capability classification	Analogue site identification
All tenures	Recontoured spoil	238.8	Grazing	III-VIII	Lot 566 on CH3 1740
		30	Native ecosystem	VIII	Lot 1 on RP35744 Lot 2 on RP159172
All tenures	Sediment and water supply dams	7.8	Sediment and water supply dams	VIII	n/a
ML4698 ML4568 ML 4584	Infrastructure areas	2.0	Retained infrastructure	VIII	n/a

Note: PML Class VIII is defined as 'land with limitations that would preclude its use for any form of agriculture'. We would interpret that the inclusion of class VIII lands for all but the native ecosystem PMLU is intended to be restricted to minor areas within the PMLUs.

There is no change to the total area of native ecosystem PMLU proposed under the PRCP, and the residual void NUMA is no longer relevant given that no residual void exists. The biggest contributing factor to the smaller proposed grazing PMLU is the substantially smaller footprint of land disturbance at Oakleigh West. Although the EA authorises a total of 194.1 ha of disturbance at Oakleigh West, only 134.5 ha was disturbed during operations. As shown in Figure 12, the EMOS land use plan indicates a much larger footprint of mine disturbance proposed at Oakleigh West; with the majority to be returned to a grazing PMLU.

A total disturbance area of 2.0 ha is authorised under the EA for retained sediment and water supply dams. Following the completion of rehabilitation, the sediment and water supply dams PMLU will incorporate a total area of 7.8 ha. This discrepancy arises for the following reasons:

- as outlined at section 3.3.1, the EA was issued primarily to authorise mining activities in Oakleigh West, which may not have allowed for the representative regional density of stock water storages appropriate for the Normanton and Oakleigh East rehabilitation planning areas;
- the completed drainage and sedimentation structure works at the Normanton rehabilitation planning area, and the proposed drainage and sedimentation structures at Oakleigh East have been designed to contemporary engineering standards taking into account run-on catchments and sedimentation capacity.

In summary, the final PMLUs proposed for the Project of grazing, native ecosystem, sediment and water supply dams and retained infrastructure:

- are generally considered viable, having regard to the use of land in the surrounding region;
- are consistent with how the land was used before the mining activity was carried out on the land;
- are consistent with the uses of land permitted under the Planning Act; and
- will deliver, or aim to deliver, a beneficial environmental outcome that is acceptable to the local community.

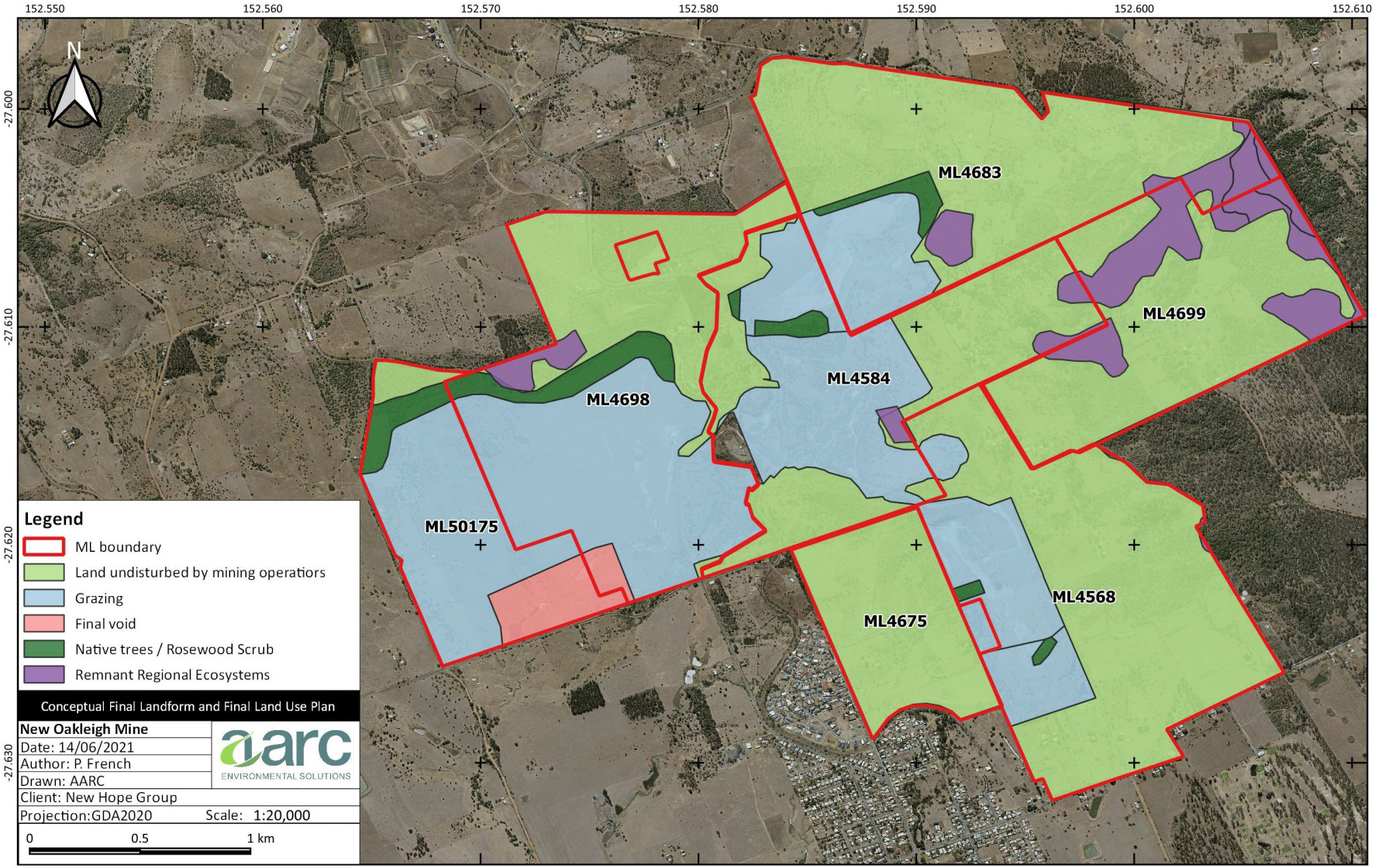

Figure 12: Project PMLUs identified in the EMOS

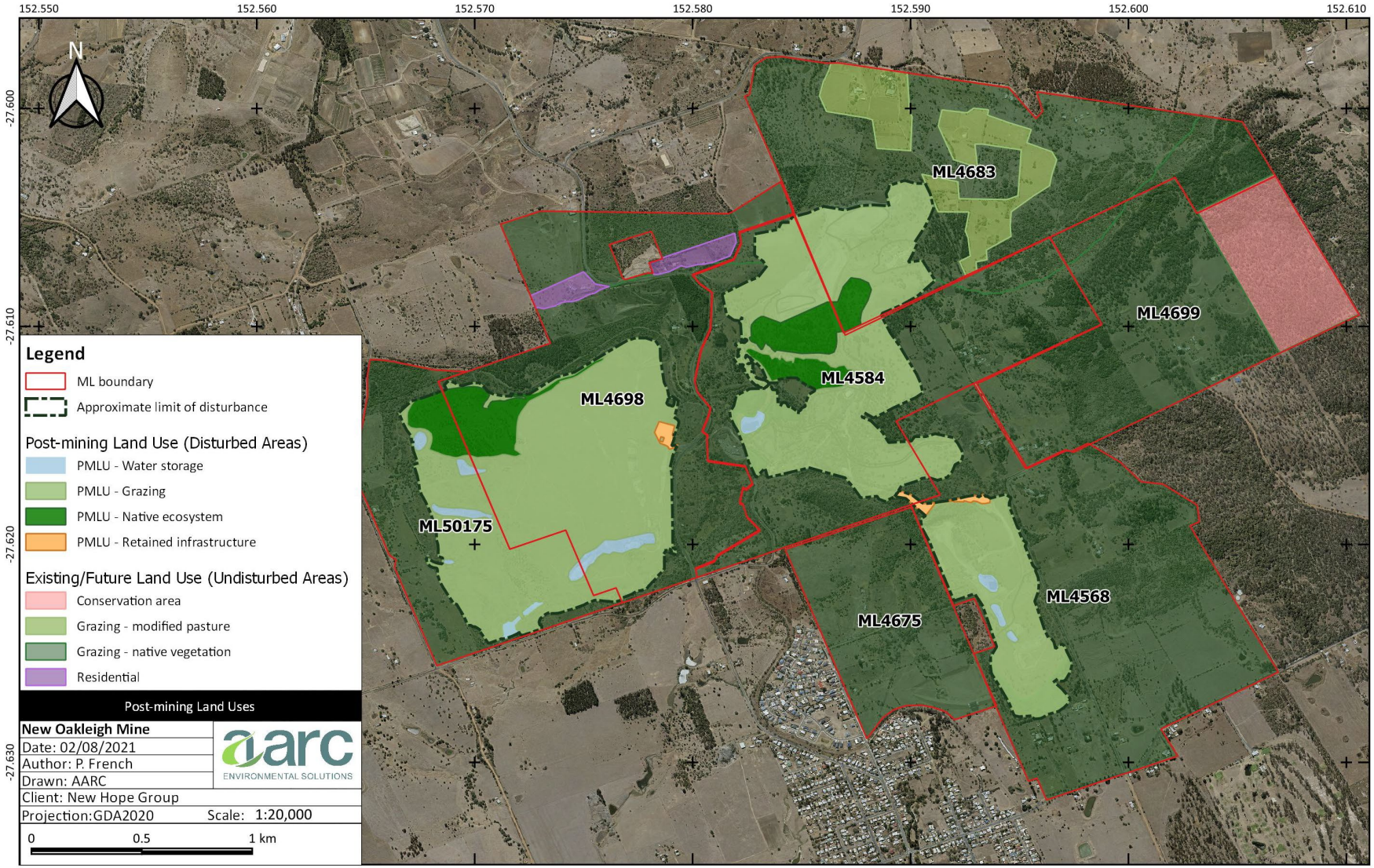

Figure 13: Proposed PMLUs and existing land uses at closure

3.4 Non-use management areas

No NUMAs are proposed for the Project site.

3.5 Rehabilitation and management methodology

3.5.1. Rehabilitation objectives and rehabilitation status

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) which intends to ensure that, for land disturbed by mining activities:

- the land is safe and structurally stable;
- there is no environmental harm being caused by anything on or in the land; and
- the land can sustain a post-mining land use (section 111A of the EP Act).

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

The proposed PMLUs for the Project site are grazing, native ecosystems, sediment and water supply dams and retained infrastructure. Rehabilitation activities have been, and will continue to be, conducted towards these outcomes. The rehabilitation strategy for the Project has included backfilling of the residual voids to improve the final landform outcomes. Infrastructure components have also been nominated for retention to support the grazing PMLU and will be transferred to the landholder upon surrender.

In its current state, the majority of the Project site has been subject to either active rehabilitation to a defined end land use or has been subject to voluntary vegetation growth. Consequently, the Project site is currently considered to be geotechnically and erosionally stable. In relation to Oakleigh West, all but 15 ha has been rehabilitated to a grazing PMLU and has been subjected to grazing pressure through grazing trails which have demonstrated the achievement of this PMLU. The remaining 15 ha has commenced transition to a native ecosystem PMLU, but require maintenance and management interventions to achieve the nominated completion criteria.

The Normanton rehabilitation planning area was completely reshaped during 2020-2021 to synergistically relocate a visually intrusive waste rock dump to backfill and buttress a remnant highwall. While some steep slopes were required to be incorporated to achieve integration with surrounding landforms, a robust and engineered drainage and sedimentation system has been included to address risks of erosion and sedimentation. This rehabilitation planning area will now be subjected to rehabilitation monitoring and maintenance and management as required.

The Oakleigh East rehabilitation planning area, while predominantly stable, requires maintenance works to address some steep slope challenges and to incorporate a properly integrated site drainage system. These rehabilitation works have been designed and a proposed implementation program has been included within the milestone schedule attached to this PRCP. The remaining 15 ha of native ecosystem PMLU are proposed to be included as part of the proposed rehabilitation works.

The 30 ha of native ecosystem land use required to be included under the EA has specific objectives including a requirement to be self-sustaining and of local provenance.

Table 11 provides a summary of the designated PMLU areas and the current rehabilitation status of each PMLU.

Table 11: Summary of current rehabilitation status (ha)

PMLU	West	East	Normanton	Total
Available land*				
Grazing	0.0	34.3	0.0	34.3
Native ecosystem	0.0	15.1	0.0	15.1
Water storage	0.0	0.0	0.0	0.0
Retained	0.0	0.0	0.0	0.0
Total	**0.0**	**49.4**	**0.0**	**49.4**
Rehabilitated land				
Grazing	112.7	55	36	203.7
Native ecosystem	15.1	0	0	15.1
Water storage	5.9	0.8	1.1	7.8
Retained	0.8	0	1.2	2.0
Total	**134.5**	**55.8**	**38.3**	**228.6**
Total area of mine disturbance (ha)	**134.5**	**105.2**	**38.3**	**278.0**

*Available land has been subject to previous rehabilitation activities since mining ceased, but requires further works to transition the land to the specified PMLU.

3.5.2. Rehabilitation indicators and completion criteria

Key to assessing the success of rehabilitation is the definition of performance indicators and completion criteria. Rehabilitation performance indicators are preferably specific, measurable, achievable, realistic and timely. The rehabilitation performance indicators should:

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

Conditions F3-F6 of the EA, reproduced below, provide some guidance with respect to indicators and completion criteria.

> *F3 Areas which are to be progressively rehabilitated to grazing pasture must comply with the following outcomes;*
>
> *a) Generate a self-sustaining vegetation with foliage protective cover, species composition and species distribution comparable to analogue site Lot 566 on CH31840; and*
>
> *b) All area disturbed by mining activities must be rehabilitated to the landform design criteria defined in Schedule F–Table 2; and*
>
> *c) Landforms are stable with rates of erosion comparable to analogue sites; and*

d) A measure of productivity (e.g. sustainable dry matter production, stock live weight gain) are comparable to analogue site Lot 566 on CH31740.

F4 Areas which are to be progressively rehabilitated to grazing pasture must comply with the acceptance criteria as defined by the Report titled 'Investigation of Rehabilitation Area and Proposal for Acceptance Criteria—Grazing Outcome August 2004' (received on 20 June 2005) for the New Oakleigh Mine that was prepared by the BTEQ to meet the outcomes in condition F3 and the landform design criteria in Schedule F–Table 2.

F5 Area which are to be progressively rehabilitated to native ecosystem must comply with the following outcomes;

a) a self-sustaining native ecosystem has been established and species composition and distribution is comparable with that of analogue sites to be determined by the study detailed in F6; and

b) all areas disturbed by mining activities must be rehabilitated to the landform design criteria defined in Schedule F–Table 2; and

c) landforms have been reshaped as closes as practicable to the aspect orientation appropriate to the climax community; and

d) species composition does not include new genetic material from native species outside the local area.

F6 Complete an investigation into rehabilitation of disturbed areas and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in F5 and landform design criteria in Schedule F–Table 2 within 24 months of the granting of ML50175.

The report 'Investigation of Rehabilitation Area and Proposal for Acceptance Criteria—Grazing Outcome' (BTEQ 2004), was submitted to satisfy Condition F4. Key findings and suggestions from this document have been incorporated into the development of rehabilitation indicators and completion criteria. The document, 'Investigation of Analogue Site and Proposal for Acceptance Criteria – Native Ecosystem Outcome' (BTEQ 2005a) was prepared and submitted to the then Environment Protection Agency on 1 September 2005 to satisfy Condition F6. Subsequent third-party reviews have determined that the native ecosystem rehabilitation criteria are not considered achievable in a reasonable PRCP period, as the criteria are representative of achieving 'old growth' rather than 'self-sustaining' remnant communities.

To provide a contemporary and relevant set of indicators and completion criteria that meet the SMART principles of being specific, measurable, achievable, reasonable and time specific, a set of performance indicators has been identified for the Project. These indicators are intended to provide a clear definition of successful rehabilitation for each rehabilitation area, along with a set of completion criteria able to demonstrate the successful completion of the closure process. Indicators and completion criteria have been developed to demonstrate:

- productivity of the land (for agricultural PMLUs), or its suitability for native habitat;
- stability of rehabilitated areas (e.g., acceptable slopes and maximum distance between erosion control devices);
- acceptable water quality;
- sustainable and acceptable rates of erosion;
- engineering standards and certifications for retained infrastructure, where applicable; and
- remediation or listing of any lands subject to contamination.

Grazing completion criteria have been derived for each milestone on the basis of contemporary standards and the intent of the milestone achievement. To achieve the 'stable' milestone (RM2), vegetation groundcover in grazing rehabilitation areas would need to exceed the 70% percentile of cover recorded at

grazing reference sites. In conjunction with the erosion assessment criteria, this threshold is considered adequate for ensuring landform stability where peak pasture productivity has not yet been achieved.

Given that success of grazing land rehabilitation can be directly influenced by the intensity of grazing pressure, the milestone criteria will utilise both monitoring data (e.g., pasture species presence, ground coverage, erosion classification, etc.), and assessments of land capability classification and carrying capacity to demonstrate the achievement of a sustainable grazing outcome and target PMLU. This determination will be supported by various assessments completed by suitably qualified persons including a final rehabilitation report (including all monitoring records) and an assessment of carrying capacity.

Native ecosystem target PMLU (RM3) milestone criteria have been derived to:

- ensure the presence of key species known to occur locally in association with the target regional ecosystem (RE 12.9-10.6);
- achievement of remnant vegetation status (RM3) in accordance with the Neldner *et al*. (2020) methodology (70% of the height and 50% of the cover of the analogue site undisturbed predominant canopy);
- provide habitat that is safe for fauna; and
- provide evidence that the landform presents low risk of land contamination and erosion.

The RM2 criteria are designed to ensure landform stability is achieved and facilitate progression towards the RM3 criteria.

The nominated performance indicators and completion criteria for the Project are set out in Table 12. The performance indicators are assessed against completion criteria, which act as targets for the rehabilitation process. The rehabilitation areas referred to, and their relationship with rehabilitation milestones, are discussed further in section 3.5.3.

Table 12: Rehabilitation objectives, indicators and completion criteria for the Project

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM1 **(Rehabilitated)**	• Absence of mine infrastructure equipment and materials not required for the PMLU.	• All non-required services disconnected and removed; • all non-required concrete, bitumen and gravel removed; • all non-required operational pipelines drained and removed; • all fencing that is not part of PMLU requirements removed; • all non-required buildings demolished and/or removed; • all machinery and equipment removed; • all non-retained surface water drainage infrastructure removed; and • all rubbish removed.	In-pit spoil (RA3), Tailings dam (RA4), North highwall (RA5), Eastern drainage (RA6), Normanton mine disturbance (RA7), Native ecosystem rehabilitation area (RA8), and North mine disturbance (RA9)
	• Absence of contaminating materials/ contaminants.	• Where required or applicable, contamination is remediated or removed.	
	• Evidence of appropriate landform surface preparation (contour ripping, presence of topdressing, application of amelioration materials where required). Only applicable to rehabilitation post 2021.	• All bulk earthworks and landform works completed; • Sufficient topdressing material (topsoil or a suitable topsoil substitute) spread over reshaped surfaces; • ameliorants have been applied where required to improve soil quality characteristics; and • visible evidence of ripping/discing along the contour (not applicable to historical rehabilitation areas).	
	• Revegetation (seeding, planting or acceptable natural recruitment). • Seed germination and development of groundcover establishment.	**Grazing and Native Ecosystem PMLU:** • Records of seeding/planting at design rates/densities; • rehabilitation monitoring data demonstrating successful revegetation; and • Evidence of target germination rates, planting success and recruitment from initial monitoring.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM2 (Stable)	• Stable landform development through: o acceptable final landform slopes (i.e. as designed); o geotechnical study completed by a suitably qualified person assessing the factor of safety for all final landforms; and • drainage design by suitably qualified person.	• 90% of the final landform achieves slope gradients of 30% or less; and 80% of the final landform achieves slope gradients of 20% or less; • landform construction of north highwall area (RA5) meets design criteria of slopes <40% with the exception of slopes in area A, which may exceed 40%: and • RA5 north highwall area vegetated and assessed by a suitably qualified person as stable with a minimum FOS of 1.5; • constructed landform in the eastern drainage works area (RA6) meets design criteria of maximum slope gradient of 20%; and • RA4 Tailings Dams assessed by a suitably qualified person as stable.	
	• Vegetation cover based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Erosion classification determined based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Land suitability assessment by an appropriately qualified and experienced person. • Acceptable surface water quality based on water quality monitoring program.	**Grazing PMLU:** • Vegetation groundcover exceeds the 70th percentile of reference sites; • erosion classification (per the Monitoring and Maintenance Plan (MM Plan)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance. • Retained storage water quality parameters (as defined in the MM Plan) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000) with the exception of TDS measured at Urry Road dam (OW21). At this water storage the livestock 'high risk' trigger values for TDS will apply, unless sufficient data is available and demonstrates that Urry Road water quality has no detrimental impact on the TDS values of the Bremer River as measured at Station 143107A.	Retained infrastructure (RA1), Water management structures (RA2), In-pit spoil (RA3), Tailings dam (RA4), North highwall (RA5), Eastern drainage (RA6), Normanton mine disturbance (RA7), Native ecosystem rehabilitation area (RA8), and North mine disturbance (RA9)

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM2 (Stable) **cont.**		**Native Ecosystem PMLU:** • Monitoring shows key species are present including: o Crows ash (*Flindersia australis*); o Brigalow (*Acacia harpophylla*); and o Whitewood (*Atalaya salicifolia*). • ≥ 35% of Foliage Projective Cover (FPC) (T1 canopy cover) at analogue site(s); • landform is deemed safe for fauna; • landform construction achieves suitable slope gradients of 30% or less; • erosion classification (per the MM Plan) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM2 (Stable) **cont.**		**Water Storage PMLU:** • Surface water overflows from retained storage, Urry Road dam (OW21) meet the following criteria: o pH: 6.5-9.0; and o TDS: 10,000 mg/L; or o surface water quality data demonstrates Urry Road dam water quality has no detrimental impact on the pH and TDS values of the Bremer River as measured at Station 143107A. • Surface water overflows from all other retained storages meet the following criteria: o pH: 6.5-9.0; and o TDS: 4,000 mg/L. • Retained storage water quality for other parameters (per the MM Plan (Appendix F)) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000).	
		Retained infrastructure PMLU: • No recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance; and • landform construction achieves slope gradients of ≤20% with the exception of slopes constructed in excess of 33% to achieve synergy with surrounding topography.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM3 (Achievement of target PMLU)	• Vegetation cover and diversity based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Land suitability assessment by an appropriately qualified and experienced person. • Erosion classification determined based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Acceptable surface water quality based on water quality monitoring program. • Hazard and Safety Assessment by suitably qualified person. • Contaminated land assessment to demonstrate no residual contamination.	**Grazing PMLU:** • provide a final rehabilitation report including monitoring records; • assessment of carrying capacity by suitably qualified person demonstrates a sustainable grazing outcome has been achieved; • > 75% of groundcover vegetation comprises recognised pasture species; • relevant land capability class III / VIII achieved; • erosion classification (per the MM Plan (Appendix F)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance.	Retained infrastructure (RA1), Water management structures (RA2), In-pit spoil (RA3), Tailings dam (RA4), North highwall (RA5), Eastern drainage (RA6), Normanton mine disturbance (RA7), Native ecosystem rehabilitation area (RA8), and North mine disturbance (RA9)

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM3 (Achievement of target PMLU) **Cont.**		**Native Ecosystem PMLU**: • Key species present including: o Crows ash (*Flindersia australis*); o Brigalow (*Acacia harpophylla*); and o Whitewood (*Atalaya salicifolia*). • ≥ 50% of number of native flora species/ha as present at analogue sites; • ≥ 70% of the T1 canopy height at analogue site(s); • ≥ 50% of FPC (T1 canopy cover) at analogue site(s); • landform is deemed safe for fauna; • evidence of low risk of land contamination via a contaminated land assessment report; • erosion classification (per the MM Plan (Appendix F)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM3 (Achievement of target PMLU) **Cont.**		**Water Storage PMLU:** • No regulated structures to be retained; • all retained water storages (banks and spillways) to be assessed for safety and function by an appropriately qualified person; • Surface water overflows from retained storage, Urry Road dam (OW21) meet the following criteria: o pH: 6.5-9.0; and o TDS: 10,000 mg/L; or o surface water quality data demonstrates Urry Road dam water quality has no detrimental impact on the pH and TDS values of the Bremer River as measured at Station 143107A. • Surface water overflows from all other retained storages meet the following criteria: o pH: 6.5-9.0; and o TDS: 4000 mg/L. • Retained storage water quality for other parameters (per the MM Plan (Appendix F)) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000).	
		Retained infrastructure PMLU: • Final landform survey confirms no built structures remain other than those that form part of a landholder agreement; • no recorded erosion classifications of 'Severe' or 'Extreme'; and • landform construction typically achieves slope gradients of ≤20%, with the exception of slopes constructed in excess of 33% to achieve synergy with surrounding natural topography.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (refer Table 13)
RM3 (Achievement of target PMLU) **Cont.**		**All PMLUs:** • Hazard and Safety Assessment demonstrates hazards in rehabilitation areas are of a similar type and not significantly different to hazards in neighbouring similar PMLUs (i.e. low risk)	

3.5.3. Rehabilitation areas and milestones

To allow the development of a PRCP schedule in accordance with the requirements of the PRCP Guideline, discrete rehabilitation areas have been identified, distinguished primarily by the sequence of rehabilitation activities deemed appropriate for each rehabilitation area. The rehabilitation areas considered relevant to the Project are outlined in Table 13 and Appendix B.

Table 13: Identified rehabilitation areas

Rehabilitation Area Reference	Description	Post-mining-land-use
RA1	Retained infrastructure	Retained infrastructure
RA2	Water management structures	Sediment and water supply dams
RA3	In-pit spoil	Grazing
RA4	Tailings dams	Grazing
RA5	North highwall	Grazing
RA6	Eastern drainage	Grazing
RA7	Mine disturbance (Normanton)	Grazing
RA8	Native ecosystem rehabilitation area	Native ecosystem
RA9	Mine disturbance (North)	Grazing

The nominated rehabilitation milestones considered relevant to the Project are outlined in Table 14. It should be noted that not all rehabilitation milestones are applicable to all rehabilitation areas. The applicability of rehabilitation milestones to the various rehabilitation areas is also indicated in Table 14.

The following rehabilitation methodology sections reference the rehabilitation areas and rehabilitation milestones listed in Table 14.

Table 14: Milestones and their applicability to rehabilitation areas

Milestone reference	Description	Applicability				
		RA1 **Retained infrastructure**	**RA2** **Water management structures**	**RA3, RA4, RA7, RA8, RA9** **In-pit spoil, tailings dam, Normanton mine disturbance, Native ecosystem rehabilitation area, North mine disturbance**	**RA5** **North Highwall**	**RA6** **Eastern Drain**
RM1	Rehabilitated – area has been prepared (contouring and topsoiling) and revegetated (seeding/planting)	x	x	√	√	√
RM2	Stable – area is rehabilitated, safe stable and non-polluting. Subject to monitoring	√	√	√	√	√
RM3	Achievement of target PMLU – area has achieved completion criteria for the target PMLU and is sustainable, stable, safe and non-polluting	√	√	√	√	√

3.5.4. Final landform design

The final landform design and outcome has been influenced by a number of factors, including the community consultation work that has been undertaken for the Project over time. A significant example is the decision to progressively backfill voids to improve the visual amenity and safety of the rehabilitated site.

Since the completion of mining at Normanton, Project operations have been limited to maintenance and rehabilitation activities. The sequencing of future landform development and rehabilitation, and the consequent rehabilitation milestone schedule are influenced by the recently completed rehabilitation works within the Normanton area and identified final rehabilitation and remediation works within the Oakleigh East rehabilitation planning area.

Schedule F–Table 2 of the EA has been reproduced in Table 15 and provides certain slope, slope length and area considerations.

Table 15: Landform design (Schedule F–Table 2)

Slope range (%)	Projective surface area (ha)	Maximum distance between erosion control devices (m)
40	5	13
30	7	23
20	10	50
15	20	13
10	22	220
5	26	520
3	28	900

A detailed landform design and revegetation study was undertaken by Landloch (2013) and included the following components:

- an assessment of the erodibility of materials using the Water Erosion Prediction Program (WEPP) model;
- provision of a set of landform recommendations for use in landform design;
- use of SIBERIA modelling to validate the proposed landform design;
- provision of general recommendations on rehabilitation strategies, topsoil management, fertiliser and soil amendments for Oakleigh East and Normanton.

Recommendations were generally used where works were subsequently undertaken in the respective rehabilitation planning areas. However, in some rehabilitation planning areas (particularly Oakleigh East) additional studies were undertaken to address specific rehabilitation challenges identified. These studies are described in the respective sections following.

3.5.4.1 Oakleigh West

Final landforms have been established at Oakleigh West and, as far as practicable, are consistent with Schedule F–Table 1 of the EA. Rehabilitated final landforms include native ecosystems (15 ha), grazing, water storage structures and a small area of retained infrastructure.

Due to concerns raised through the community consultation program, the residual void at Oakleigh West was progressively backfilled using mined spoil, and as a result, no final void remains. The final landform was constructed to create a landform comparable to the original topography and blends into the surrounding natural topography. The recontoured surface was spread with topsoil, either directly or from existing topsoil stockpiles. Landforms were seeded with pasture species to suit the post mining land use. Native ecosystem rehabilitation areas were subsequently established and have undergone progressive revegetation since 2001. Rehabilitation works at Oakleigh West finished in early 2016.

Existing built infrastructure includes a short partially bitumen-sealed and gravel access track, concrete slabs, relocatable shed and an above ground diesel storage tank. A number of small water storage dams are to be retained for stock watering purposes as per the Landholder Agreement (NHG 2021a, Appendix H). The concrete plant pad is to be retained to support the future grazing management activities. A set of cattle yards has been installed to assist with current grazing activities. The above ground diesel storage tank is to be retained and transferred to the landholder to support the grazing PMLU.

Figure 14: Oakleigh West: pre-rehabilitation—pit depth of approximately 90 m (2012)

Figure 15: Oakleigh West: Post-rehabilitation—established grazing PMLU (2017; note retained infrastructure)

3.5.4.2 Oakleigh East

Final landforms to be established at Oakleigh East include grazing and native ecosystem areas, water storage structures and retained infrastructure (access tracks).

To date, land previously disturbed by mining at Oakleigh East has undergone the following rehabilitation activities:

- infrastructure removal;
- dewatering, capping, soil amelioration and seeding of tailings dams 1 and 2; and
- recontouring, topsoiling, soil amelioration and revegetation works.

Remedial activities will be the focus of planned future rehabilitation works required to stabilise final landforms in the north highwall area and construct drainage works within the eastern catchment area (Figure 16). Detailed design studies have been completed to guide the required remediation activities as described in the sections below.

North highwall area

In February 2019, modelling performed by Knight Piesold to assess the stability of the northern highwall indicated that the factor of safety (FOS) for the current slope condition was below an acceptable level. Therefore, additional runs were conducted on a conceptual rehabilitation profile which would involve minor reshaping to form a reduced slope profile and additional buttressing of the slope toe. The original proposal was to reduce the slope and height of the highwall area to a typical 1:5 grade (20%). However, when these general principles were applied to the specific area, it was found that they were unworkable and likely to lead to further ongoing rehabilitation issues.

A part of the area behind the highwall was already well-established and rehabilitated to a relatively stable condition. The flattening of the top of the highwall (to reduce overall height) and the introduction of the typical 20% slope would have resulted in significant clearing of the already rehabilitated and revegetated area and an extended disturbance footprint beyond NOC's property boundary.

To further address this issue, in February 2020, Sherwood Geotechnical and Research Services (SGRS) performed an in-depth review of the stability of the north cut highwall. SGRS analyses were carried out for two potential mechanisms:

1) **Circular arc sliding with stability controlled by rock mass strength:** The minimum computed FOS was 2.15 within the spoil backfill in the lower part of the slope, and the minimum computed FOS was 2.28 for the highwall overall.

2) **Block sliding along a weak tuffaceous clay band:** In addition to the slope phreatic surface, potential tension cracking to a depth of 5 m was also considered. For the tension crack completely filled with runoff water, an extreme case, the minimum computed FOS was 1.83.

SGRS's review concluded that the check calculations demonstrated acceptable highwall slope stability for the current geometry. The analysis used a more localised FOS based on local knowledge and experience of the geotechnical team, which determined that slip failure was unlikely.

SGRS further recommended suitable neutralisation and erosion-resisting treatments to be applied to manage risks associated with exposed carbonaceous materials at the current slope inclination.

As a result of a remaining concern related to the top section of highwall being significantly steeper than the general 20% nominal design criteria for long-term erosion and soil stabilisation, further investigation was carried out by Houghton Environmental Management (Houghton 2020). The study assessed the following aspects in relation to rehabilitation of the northern highwall area:

- the historic and current erosional severity and stability of the area in question;

- the prospect of achieving erosional stability in the area to the extent that the slope can be suitably rehabilitated and be sustainable in the longer-term; and
- the options available for stabilising and rehabilitating the area and determination of the most appropriate methods.

The assessment indicated that the prevailing slope of the northern highwall area is a relatively consistent 23%-25% gradient through previously rehabilitated and adjacent vegetated land (equivalent to 13°-14°). However, some localised short slopes exist which may exceed 33% (18°) – principally within Area A – shown in Figure 17.

Based on the geotechnical assessments undertaken, geotechnical factors are unlikely to result in significant failure of the existing slopes. The existing erosion within the poorly vegetated Area A is the main cause for concern and has arisen due to poor existing soil quality conditions making revegetation difficult. This area will be subject to more intensive erosion control works, soil amelioration and revegetation works intended to provide surface erosion protection.

While the slopes within and adjacent to Area A (Figure 17) are steep, they are not so steep that vegetation stabilisation could not be successfully achieved. Flattening the affected bare area and lands upslope to under 20% is considered inappropriate and will likely exacerbate erosion levels over a broader area in the short to medium-term.

Based on the Houghton (2020 [Appendix H]) investigation findings, the recommended strategy is to:

- topsoil Area A with a suitable depth of soil/weathered material (a minimum depth of 30 cm is recommended); and
- apply surface stabilisation measures, such as seeding in combination with use of Grassroots^{TM} geofabric or equivalent, and the appropriate application of hay bales or silt fences.

This remaining remedial work will be carried out in accordance with the PRCP milestone schedule.

To ensure these assessment outcomes are met, landform stability completion criteria for the North highwall area conform with the design slope criteria of achieving a minimum FOS of 1.5 (KBR 2020). Specifically, to satisfy the stable milestone (RM2), the North highwall landform is to be constructed to slope gradients of less than 40%, with the exception of slopes in Area A, which may exceed 40%. Despite the steep gradient of this slope, it has been demonstrated that erosion in Area A is inactive or slow and the erosional stability is likely to be achieved at the existing gradient with the application of specific surface treatments (i.e., erosion protection measures combined with revegetation) (Houghton 2020). To achieve the ‘stable’ milestone (RM2), the north highwall shall be vegetated and assessed by a suitably qualified person as stable with a minimum FOS of 1.5.

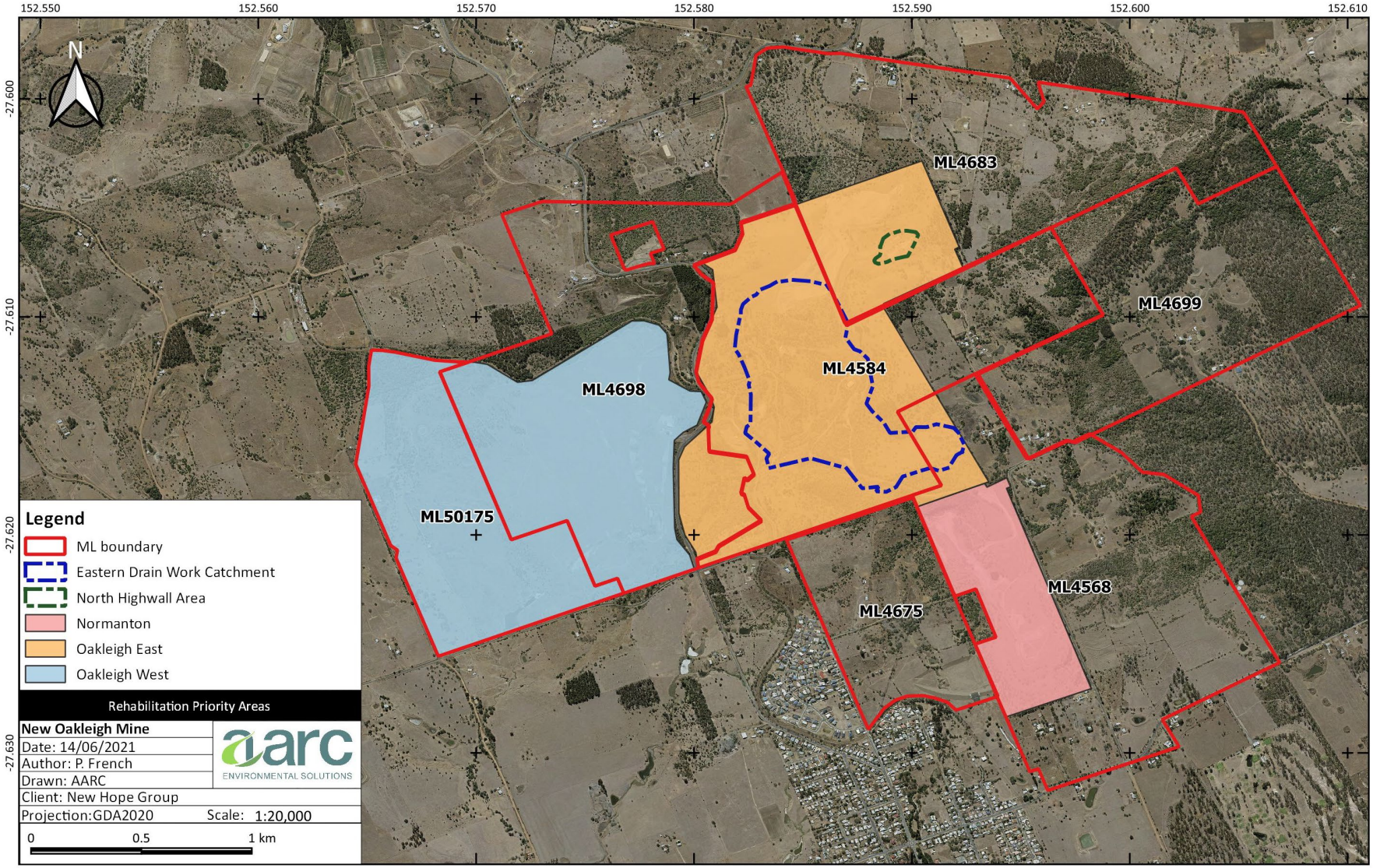

Figure 16: Oakleigh East rehabilitation priority areas

Eastern drains

The development of an east-west drainage system to collect run-off from the northern area has been identified as a key component of rehabilitation works for Oakleigh East (Palaris 2014a). The main objectives for the east-west drainage system include:

- designing a system to avoid significant impacts on the Rosewood-Marburg Road by maintaining the existing culverts on Covers Gully as the primary point of discharge;
- minimising any impact on the historic rail corridor;
- minimising the extent of disturbance required to establish the drainage system; and
- limiting the maximum slope gradient for newly disturbed areas to 20%.

KBR (2020) undertook a review of the proposed landform works to reinstate and realign a new east–west drain that would discharge through the pool adjacent to the existing run-of-mine (ROM) pad (former stockpile area) at the Rosewood-Marburg Road.

Following the approximate line of the design in Palaris (2014a), the grade and depth of the drain were developed to ensure that discharge velocities did not lead to significant scouring over time. The design was finessed with the use of a proprietary Grassroots™ or similar product, and rock pitching proposed along significant lengths to avoid the need for drop structures. Areas to be disturbed will be stripped of topsoil prior to earthworks occurring with topsoil stockpiled for later rehabilitation use. As the area disturbed is equivalent to the area to be rehabilitated, there is not expected to be any topsoil shortfall for rehabilitation works. Biosolids have been successfully utilised on site for previous rehabilitation works and are available to supplement topsoil resources if required.

The adoption of a 20% side slope for areas draining to the main drainage line results in an excess cut volume of approximately 45,000 m^3. The majority of the excess material will be deposited in the following three locations:

1) on the existing ROM pad where capping of the significantly disturbed area has occurred, with a proposed minimum of 1.0 m of material;

2) on existing, reshaped overburden rock piles; and

3) within the historic railway reserve to help reinstate the existing railway embankment that has been subject to localised erosion, and which will also assist any future effort to re-establish the historic rail line should this occur.

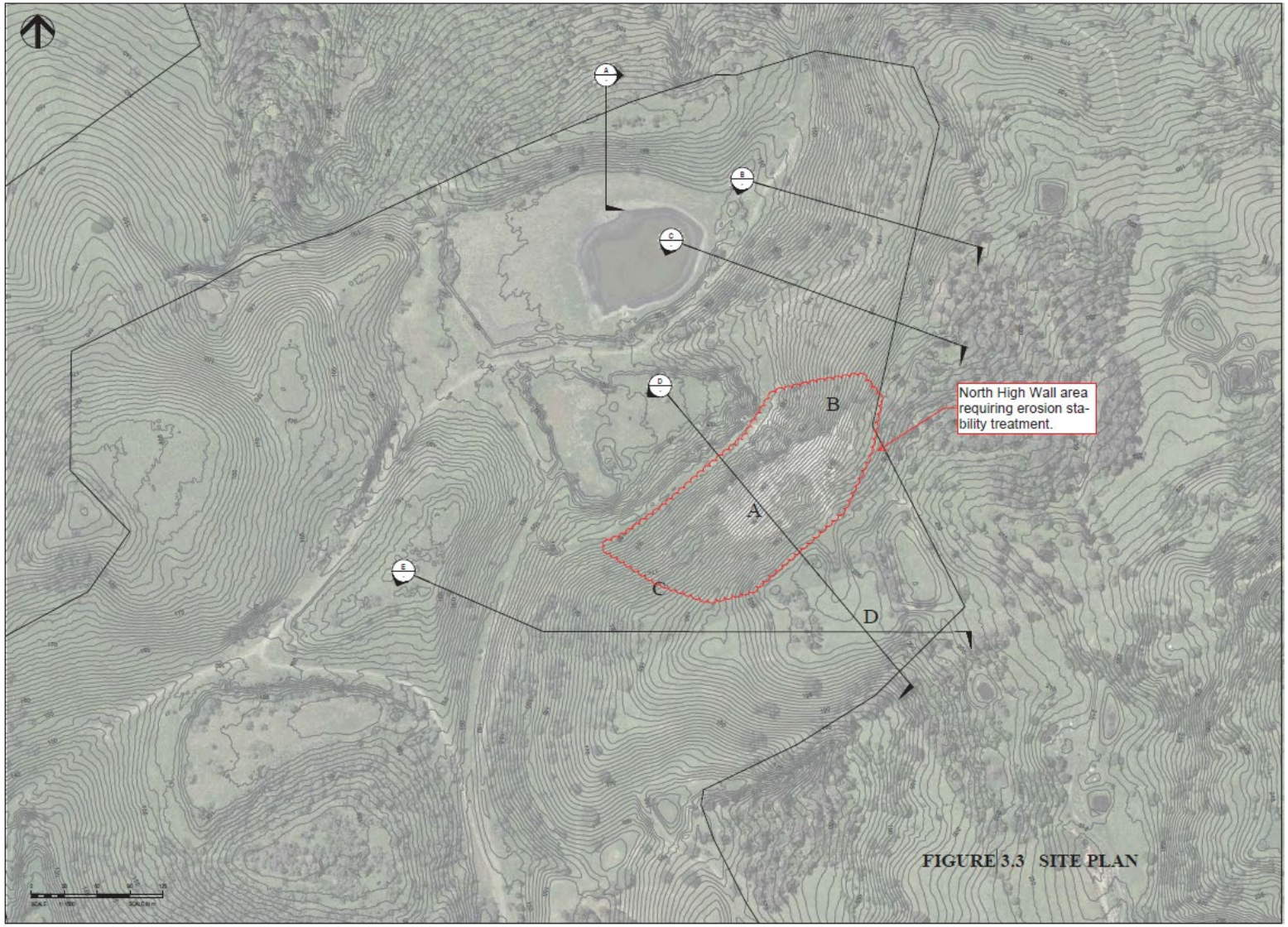

Figure 17: General boundary and cross-sections assessed of the Northern Highwall area with 1m contour overlay

KBR (2020) undertook a number of iterations of the drainage design for this area to reduce the need for drop structures and minimise disturbance to adjacent land, especially in those areas where rehabilitation and regrowth has already been established. The general layout of the proposed drainage for the eastern and northern sub-catchments is shown in Figure 18. The drainage design incorporates two main trunk drains (eastern drain DR01 and northern drain DR02) that outflow into the existing Wash Plant Dam, which will act as a settling pond (Figure 18). Minor branch drains along with chutes and berm drains are to be used to further manage natural runoff from the site area and control erosion.

A proprietary Grassroots^{TM} or similar product is to be utilised for the majority of areas in combination with rock armouring at downstream points to control flow velocities and erosion within the main drains. The application of the combined products is aimed at maintaining flow velocities and bed shear stress to less than 5.7 m/s and 390 Pa, respectively. These drainage construction measures have been developed to keep cumulative soil losses to less than 1.8 mm for a 1% Annual Exceedance Probability rainfall event.

Rock armouring has been sized to reduce velocities at drain/chute outlets as they approach the Wash Plant Dam. A dissipation pool was required to prevent erosion at the junction of the minor branch drains. A flood depth simulation has been run using TUFLOW for the proposed works, and the output results are presented in Figure 19.

The proposed drainage construction works are scheduled for completion as part of the PRCP schedule. The KBR (2020) design report will guide the scope of works for the drainage construction to be completed as part of the milestone schedule.

The final landform constructed as part of the eastern drainage works (RA6) will achieve a maximum slope gradient of 20% as per the design criteria specified in KBR 2020.

3.5.4.3 Normanton

Prior to rehabilitation, the Normanton pit area included a near vertical cliff face. Spoil and tailings had previously been deposited as a waste rock dump at the southern end of the pit excavation area. An access road traversed the west side of the excavation rising from ground level to the top of the cliff, with evidence of significant erosion due to gradient issues and the quantity of run-off along the road. The top of the cliff area is generally flat and had previously been rehabilitated. Significant tree, shrub and pasture growth exists at the top of the cliff area.

The Palaris (2014b) concept closure and rehabilitation plan report recommended cutting back the top of the cliff face and backfilling in front of the wall while reinstating the drainage along the edge of the access road. Standard bulk push arrangements were proposed to achieve the vertical and horizontal dimensions of the site for a stable 1:5 (20%) slope.

Approximately 1.4 Mm^3 of material was required to fill the area and develop a stable 20% slope arrangement. Initially, the material was to be sourced from either cutting back the top of the cliff and battering it back to a 20% slope then using surplus material from the eastern drain to provide the remaining fill. The drawback of this approach would be that a large area of rehabilitated slope at the top of the cliff face would need to be disturbed in order to provide the stable 20% final slope.

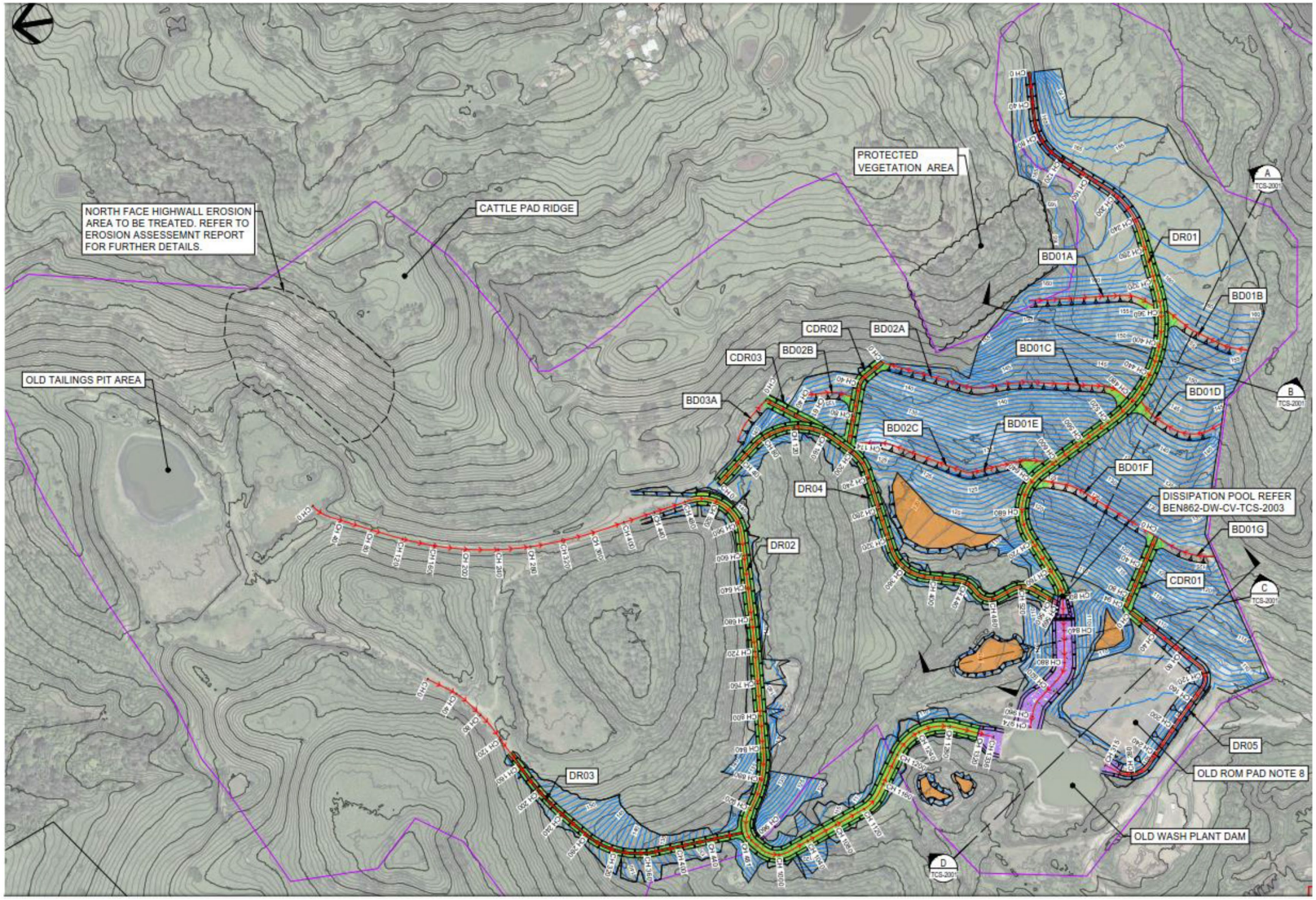

Figure 18: Eastern Drain Area general arrangement

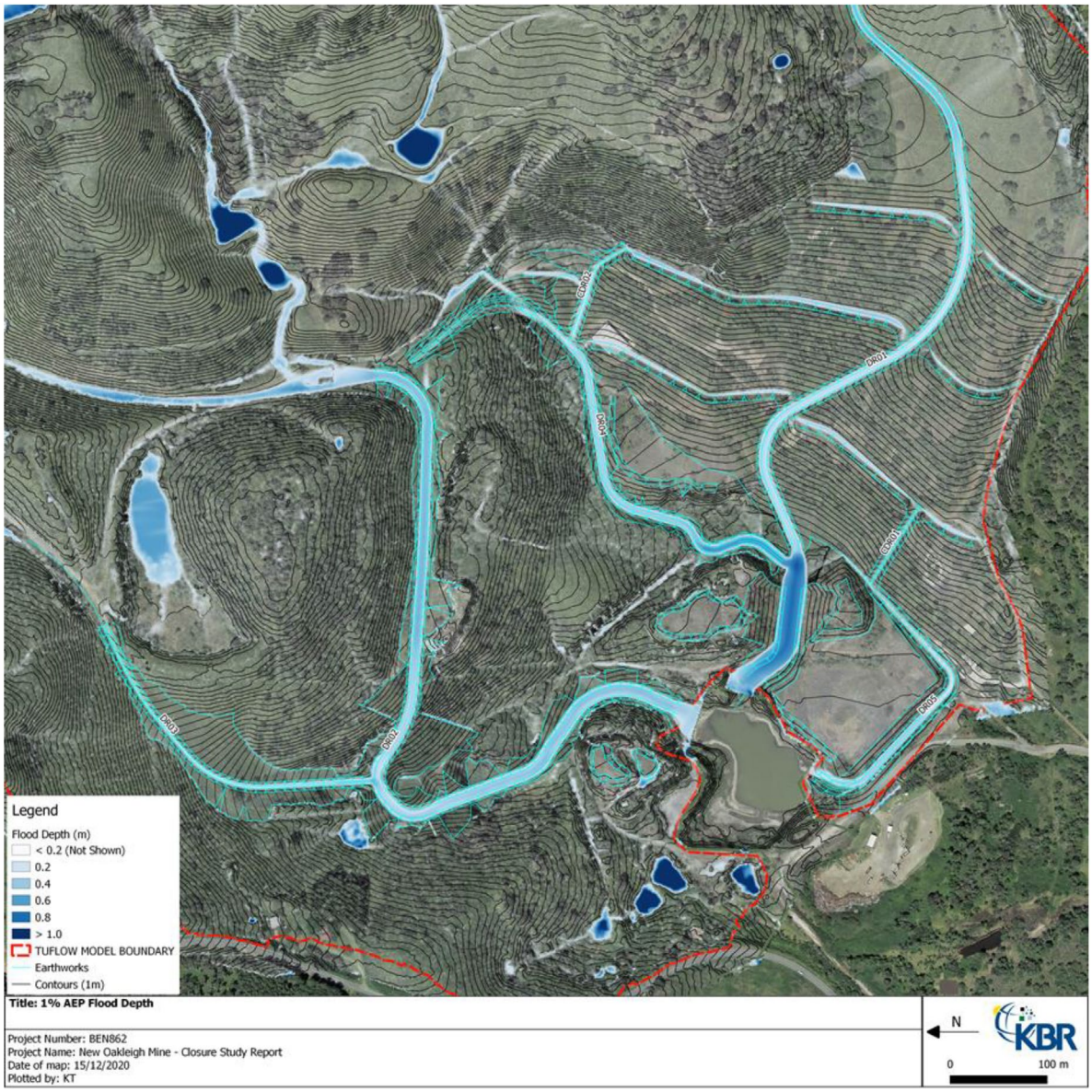

Figure 19: Modelled 1 in 100-year flood depths

To avoid this additional disturbance, an alternative solution was adopted that involved trimming the eastern edge of the existing excavation and borrowing material from Normanton's southern dump area to the south to generate the remaining fill (KBR 2020). This alternative solution also included the reinstatement of drainage adjacent to the access road and development of drainage basins south of the site, that would ultimately feed into the existing drainage network.

The Normanton area rehabilitation design layout is shown in Figure 20.

Bulk push operations on the Normanton pit were commenced in 2019 and completed in June 2021. The landform was constructed based on the preliminary design provided by KBR (2020). The final approved design (KBR 2020) was refined during construction resulting in some minor changes to the levels. In total, 1,357,800 m^3 of material was removed from a borrow area within Normanton to backfill the void. The rehabilitated final landforms at Normanton are shown in Figure 21.

Future works on the Normanton pit area will be limited to rehabilitation monitoring and maintenance. The remaining works will be undertaken in accordance with the PRCP milestone schedule.

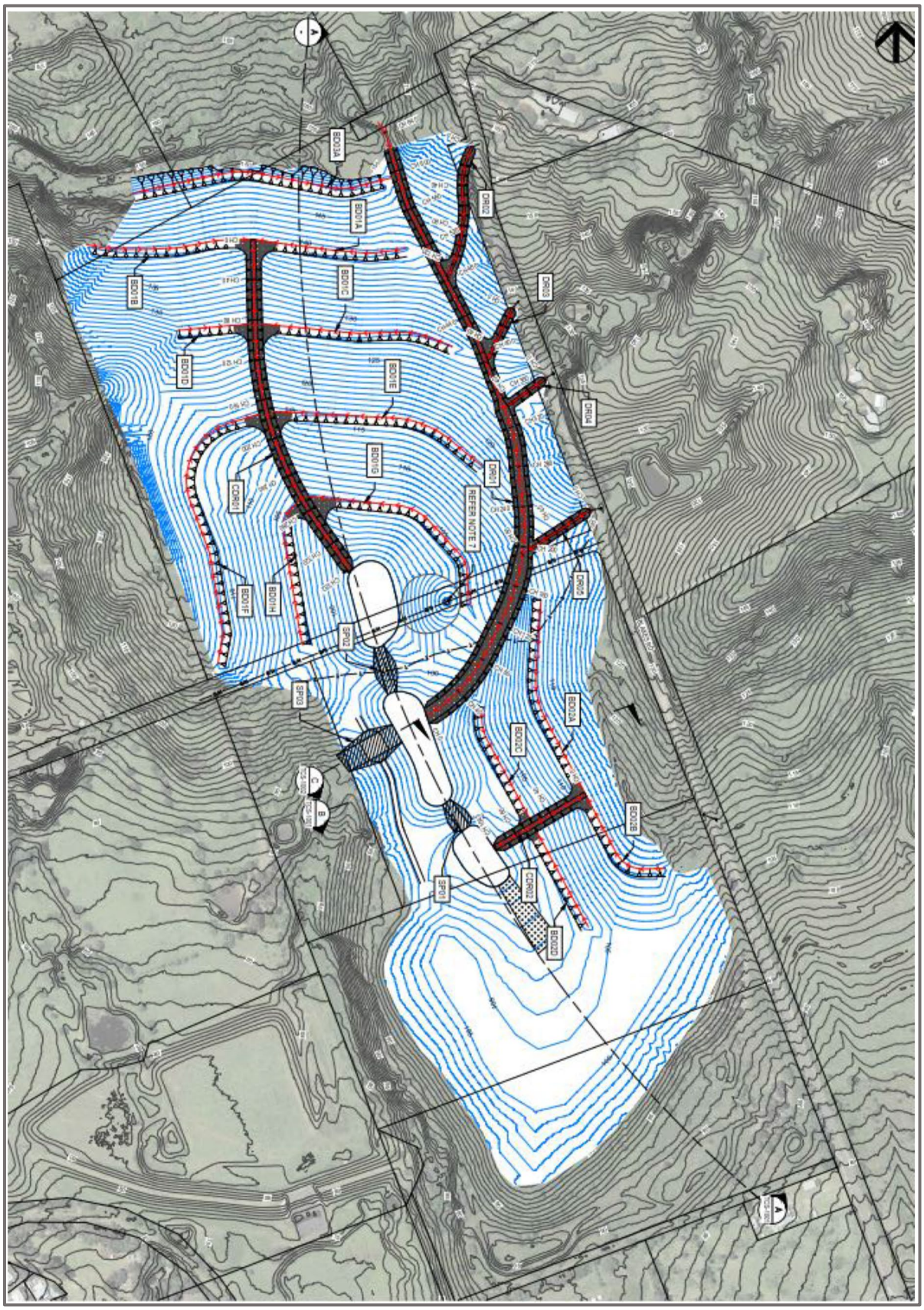

Figure 20: Normanton area final rehabilitation and drainage general layout

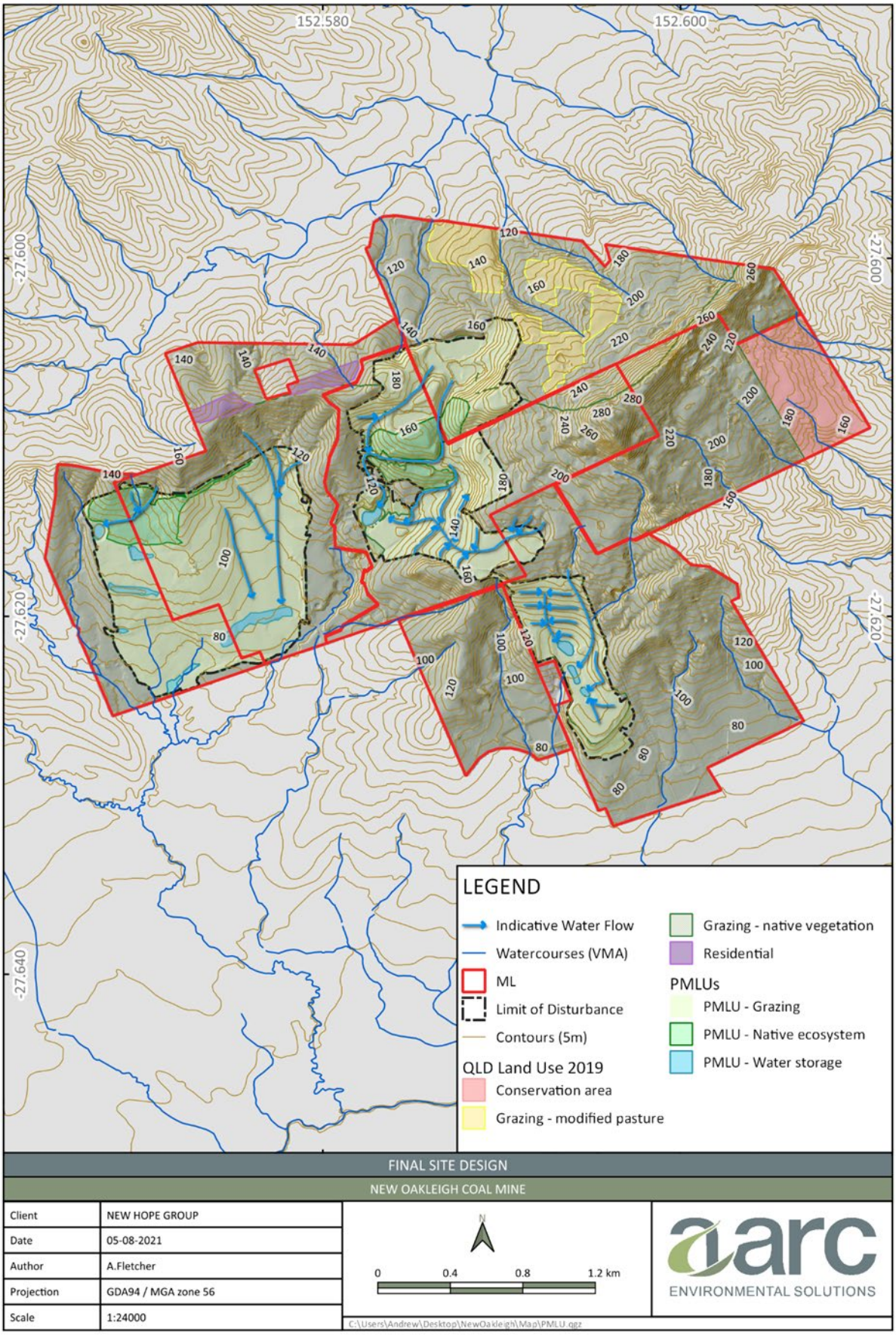

Figure 21: Final landform

3.5.5. Tailings dams capping

ATCW (2014) undertook an options assessment for capping of Tailings Dam 1 (Figure 22) located within the former North Pit on the eastern side of the Rosewood-Marburg Road. The tailings dam is approximately 150 m x 250 m, sloping from west to east, with a decant/water pond formed on the eastern margin of the deposit. Given that no tailings had been deposited since 2004, it was expected that the tailings beach would be dry and consolidated at the time of the assessment. A total tailings surface area of approximately 4 ha was adopted for the assessment (ATCW 2014).

The tailings dam capping works and layout plan are shown in Figure 22.

ATCW (2014) also assessed the suitability of capping materials available for construction. Assessed capping materials included:

- mine spoil derived from the open cut mining operation as overburden and interburden material; and
- course rejects derived from the CHPP during operation of the mine and typically co-disposed within spoil stockpiles.

Bulk samples from the stockpiles of the above areas were recovered for geotechnical testing which indicated that select materials from the mine spoil materials could achieve the following characteristics being targeted for use in capping construction.

- Materials would be able to form a fill layer to achieve minimal voids and a competent horizon that would be geotechnically stable (i.e., not subject to significant vertical settlement under load).
- Materials would possess low permeability under controlled placement and compaction conditions.
- Materials are non-dispersive to the extent that soil loss potential would avoid deep erosion gullying subject for a single storm event in excess of the 10-year average recurrence interval.

Coarse reject testing results classified these materials as a fine to coarse grained silty/clayey or sandy gravel. The constituents of the reject comprise sandstone/siltstone fragments and reject coal. The fine fraction of the material is in the moderate permeability range. It was determined that this material would bind well and was therefore able to support construction traffic and achieve reasonable levels of compaction.

The ATCW (2014) assessment aimed to identify options for safely capping the tailings dam. The specific criteria for design of a capping layer to achieve this outcome were to:

1) create a stable landform capable of supporting construction plant; and

2) minimise the likelihood of erosion occurring to the final cover system, dumped soil material or deposited material.

3) In meeting these requirements, the adopted capping profile included:

    - a competent subgrade over which construction works could occur; and
    - an earthen capping layer to achieve infiltration and erodibility criteria.

Based on the assessment results and the above criteria, ATCW (2014) proposed four options for tailings surface capping of which option 1 (direct mine spoil placement over the existing tailings beach) was adopted.

Capping of the two tailing dams (Tailings Dam 1 and Tailings Dam 2) at Oakleigh East commenced in November 2018 and concluded in August 2019. Low pressure swamp dozers were used to construct a 3 m deep cap over each tailings dam. The construction of both tailings caps involved a total cut and fill volume of 259,623bcm (190,648 bcm for Tailings Dam 1 and 68,975 bcm for Tailings Dam 2) with all fill material sourced from the spoil emplacement located to the southwest of Tailings Dam 1.

The methodology used to cap Tailings Dam 1 was as follows:

1. pond dewatering and installation of a solar sump pump to continually dewater the area;

2. formation of a bench at the southern perimeter of Tailings Dam 1;
3. pushing of a 500mm lift out over the tailings dam surface;
4. repetition of step 3 to create a total of six 500 mm benches (i.e. total 3 m capping layer);
5. utilise larger machines to place additional fill to the finished level (with an approximate 0.5% grade towards the south).

The methodology used for the construction of the Tailings Dam 2 cap was based on steps 3 to 5 above, whereby spoil was placed in the initial six lifts followed by spoil placed using heavier equipment.

The final capping design and cut and fill quantities are detailed in Figure 22.

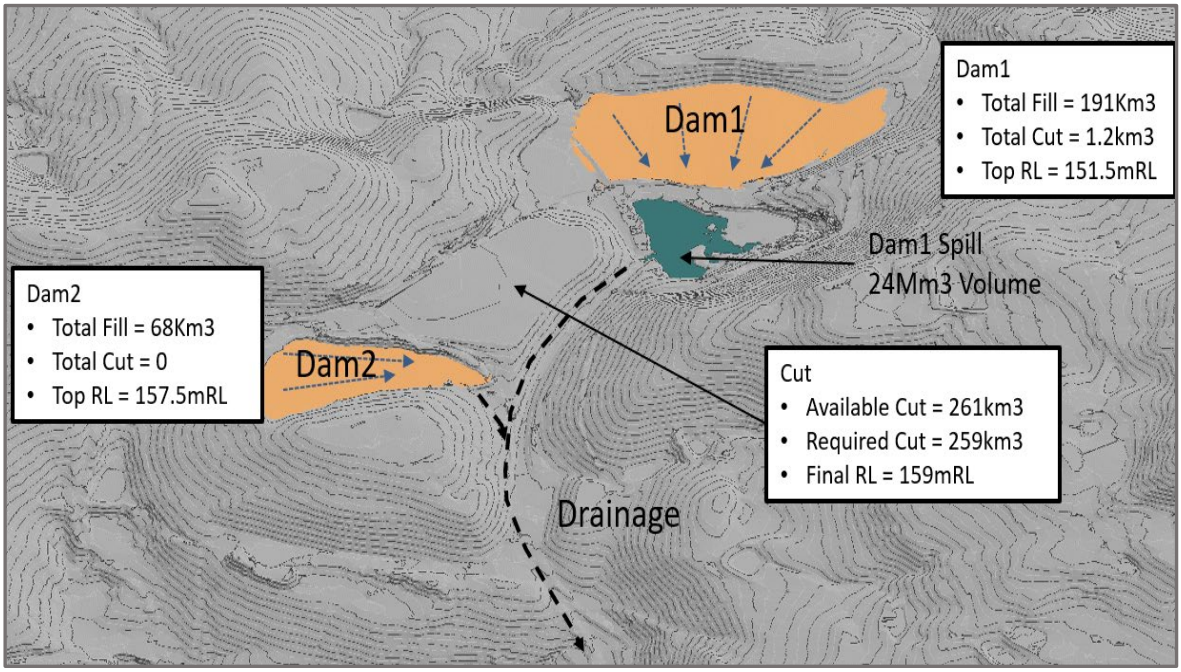

Figure 22: Final tailings capping design, fill and cut quantities

3.5.6. Revegetation method

3.5.6.1 Species selection

Grazing areas have been revegetated with pasture species sown from seed. Rehabilitation monitoring has commenced across the grazing analogue sites as well as the Oakleigh East and Normanton rehabilitation areas. Some of the original rehabilitation sites on the Normanton dump have been disturbed during the recent backfilling of the Normanton pit. The suite of flora species identified in the grazing rehabilitation and analogue areas at New Oakleigh is provided in the rehabilitation monitoring report prepared by EA Systems (2008).

The northern fringe area of the Oakleigh West out-of-pit dump (ML4698) was selected for native ecosystem rehabilitation (NOC 2007) (Figure 16). The primary advantage of this area is that the rehabilitation serves to protect and enhance the existing remnant vegetation patch immediately to the north (Figure 11). This patch has been mapped as RE type 12.9-10.6 (Figure 11) described as “Brigalow (*Acacia harpophylla*) open forest with Belah (*Casuarina cristata*) and vine thicket species”.

A species revegetation list was developed for the native ecosystem rehabilitation area based on the findings of a flora survey of the adjoining remnant vegetation patch undertaken by Martin Bennett in 2004. This list

was supplemented with species known to occur in the immediate area and considered suitable for inclusion in the native ecosystem rehabilitation area. This list is included in the New Oakleigh Native Ecosystem Rehabilitation Plan (NOC 2007). The list of species planted in native ecosystem rehabilitation areas is provided in Table 16.

The native ecosystem rehabilitation area at Oakleigh West is shown in Figure 23. This area has been progressively rehabilitated in a series of five blocks. These blocks were planted with trees and shrubs in stages between 2001 and 2008 followed by seeding. All seeds and plants were locally sourced and grown. The native ecosystem analogue site is shown as the remnant RE 12.9-10.6 polygon in Figure 23. This analogue site was previously nominated in the BTEQ (2005) report, submitted to satisfy EA condition F6.

Figure 23: Native Ecosystem rehabilitation and analogue site (RE 12.9-10.6) (NOC 2007)

3.5.6.2 Seed collection and sourcing

The native ecosystem area has been planted with trees and shrubs grown from locally sourced seed. To satisfy condition F5 of the EA, only genetic material from native species occurring within the local area has been used in revegetation of the native ecosystem area.

Greening Australia was commissioned by NOC to undertake a seed collection program in 2004. Seed was collected primarily from remnant patches of Brigalow soft wood scrub within, or in close proximity to, the Project area. Seed was also collected from *Araucarian* vine scrub. These remnants are classed as RE 12.9-10.6 and 12.8.13, respectively. Seed was processed and stored at the Greening Australia nursery at The Gap in Brisbane. All seed labels included information such as species, number of parent plants that seed was collected from, location and date of collection. Seed was propagated by local nurserymen for use in the revegetation program.

Table 16 includes a timeline of the seed collection program detailing the collection locations and species.

3.5.6.3 Ground preparation and planting

Prior to planting in grazing land use areas, the ground was prepared for planting by removing weeds through slashing, poisoning or a combination of both. The soil was then scarified to improve water infiltration and minimise mechanical impedance to root growth. At Oakleigh West, topsoil was applied where applicable to an average depth of 200 mm, and biosolids were applied to the remainder of the area.

Prior to planting in native ecosystem PMLU areas (Oakleigh West), waste rock was dumped and covered by a minimum of 1-2 m of inert clay, and a 0.5 m layer of subsoil was then spread over the inert clay layer. The subsoil was covered with a minimum of 0.15 m of topsoil, which was stockpiled from pre-clearing activities (NOC 2007).

The ground was prepared for planting by removing weeds and grass through slashing, poisoning or a combination of both followed by mechanical ripping to improve water infiltration and minimise mechanical impedance to root growth. Contour ripping generally consisted of tandem ripping to a depth of 600–900 mm with a spacing of 500–1000 mm. Mulch was applied along rip lines to enhance soil stabilisation, reduce water loss and supress weeds.

The native ecosystem rehabilitation area was planted with tree and shrub tube stock. Planting occurred when optimum soil moisture was available. Consequently, there was little need for supplementary watering. Fertiliser and wetting agent were applied at the time of planting to improve seedling survival and establishment rates.

3.5.6.4 Irrigation, maintenance and management

For most of the native ecosystem planting area in West Oakleigh, there has been little need for ongoing watering. The following management techniques have been employed in accordance with the Native Ecosystem Rehabilitation Plan (NOC 2007).

- Weed eradication programs including periodic slashing and herbicide application have been implemented as required to target potential sources of weed contamination.
- Segregation of the native ecosystem rehabilitation areas from the grazing rehabilitation areas has been of paramount importance to the success of re-establishing the native ecosystem land use, particularly when targeting a specific analogue RE.

Table 16: Seed collection program detail

Date	Collection Location	Species Collected
02/04/2004	Three remnant patches of Brigalow soft wood scrub on the Project site.	*Jasminium simplicifolium subsp. Australiense; Vitex lignum-vitae; Citrus australis; Eustrephus latifolius; Flindersia australis; Cassine australis; Carissa ovata; Geitonoplesium cymosum*
28/04/2004	Three remnant patches of Brigalow soft wood scrub on the Project site.	*Elattostachys xylocarpa; Canthium buxifolium; Spartothamnella juncea; Alectryon diversifolius; Owenia venosa; Senna acclinis; Alectryon tomentosus; Geitonoplesium cymosum; Bridelia leichhardtti; Everistia vacciniifolia; Alectryon subdentatus; Jasminum simplicifolium*
30/04/2004	Three remnant patches of Brigalow soft wood scrub on the Project site.	*Paspalidium sp.; Vitex lignum-vitae; Abutilon oxycarpum; Nyssanthes diffusa; Excoecaria dallachyana; Maytenus disperma*
25/06/2004	Three remnant patches of Brigalow soft wood scrub on the Project site.	*Melaleuca bracteate; Canthium buxifolium; Alyxia ruscifolia; Alectryon diversifolius; Owenia venosa; Cassine australis; Alectryon tomentosus; Secamone elliptica; Bridelia leichhardtii; Bursaria incana; Premna lignum-vitae; Flindersia australis*; Grass sp. (pending identification)
06/08/2004	Two remnant patches of Brigalow soft wood scrub on the Project site. Roadside remnant located on Urry Rd.	*Owenia venosa; Vitex lignum-vitae; Alectryon tomentosus; Alyxia ruscifolia; Flindersia australis; Alectryon diversifolia; Siphonodon australe*
03/09/2004	Three remnant patches of Brigalow soft wood scrub on the Project site.	*Owenia venosa; Vitex lignum-vitae; Alectryon tomentosus; Alyxia ruscifolia; Flindersia australis; Alectryon diversifolius; Siphonodon australis; Melia azedarach; Excoecaria agallocha; Cassine australe; Geitonoplesium cymosum; Elattostachys xylocarpa*
01/10/2004	Two remnant patches of Brigalow soft wood scrub on the Project site.	Flindersia australis; Siphonodon australis; Alectryon tomentosus; Alectryon diversifolium; Melia azedarach; Alphitonia excelsa; Elaeodendron australe var. australe
26/10/2004	One remnant patch of Brigalow soft wood scrub on the Project site. Remnant patch located off Keates Rd.	*Ficus obliqua*
25/11/2004	Three remnant patches of Brigalow soft wood scrub on the Project site.	*Alyxia ruscifolia; Excoecaria dallachyana; Cassine australis; Flindersia australis*
20/12/2004	Two remnant patches of Brigalow soft wood scrub on the Project site. Roadside remnants located on Thagoona Haigslea Rd, Schumanns Rd and Haigslea Malabar Rd.	*Flindersia collina; Alchornea ilicifolia; Clerodendrum tomentosa; Ehretia membranifolia; Geijera salicifolia; Streblus brunonianus; Clerodendrum floribundum; Croton insularis; Acacia maidenii*
27/01/2005	Roadside remnants of Brigalow soft wood scrub and Araucarian vine scrub located on Embreys Rd.	*Flindersia collina; Acacia maidenii; Mallotus philippensis; Excoecaria dallachyana; Eustrephus latifolius; Geitonoplesium cymosum; Elattostachys xylocarpa; Austrosteenisia blackii; Maclura cochinchinensis*

3.5.7. Water management and water quality

By virtue of the location of the site straddling the catchments of Western Creek to the south and Black Snake Creek to the north, the site has no propensity to flooding. This is supported by the absence of anything greater than Strahler stream order 2 drainage lines on the site (refer Figure 7). Drainage considerations associated with the rehabilitation planning areas are discussed in the following sections.

3.5.7.1 Oakleigh West

A stormwater investigation for the Oakleigh West mining pit rehabilitation study was undertaken in 2013 (Bornhost & Ward 2013). The study aimed to:

- investigate the stormwater characteristics of the existing site;
- recommend measures to stabilise disturbed areas following filling works, to prevent transportation of sediment into downstream properties; and
- recommend erosion and sediment control measures as per the International Erosion Control Association Best Practice Erosion & Sediment Control Guidelines, November 2008.

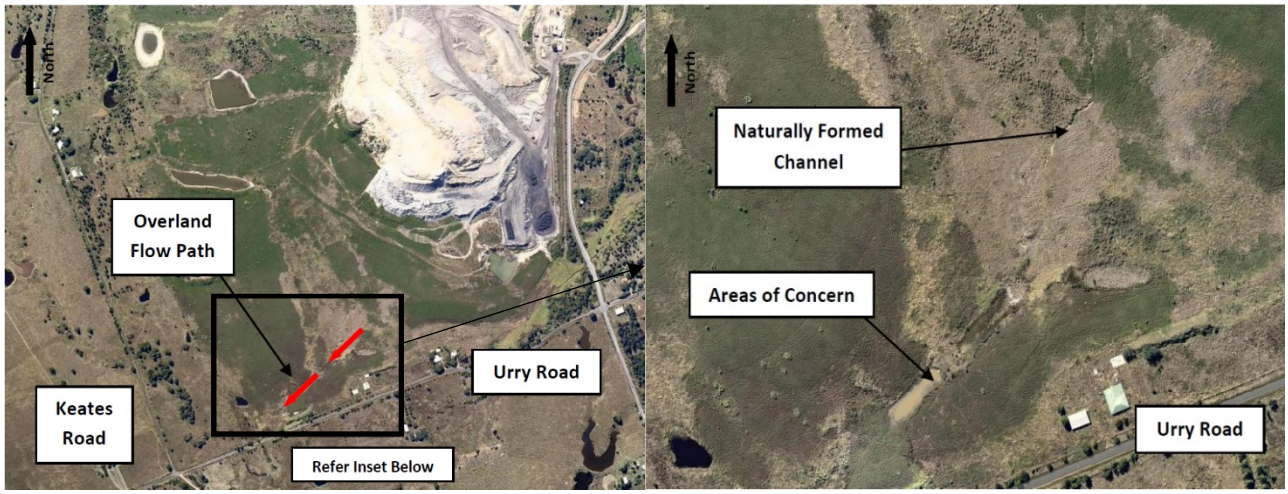

Figure 24: Aerial photos depicts the eroded areas of Urry Road Ashwell, Oakleigh West

The assessment concluded that significant external catchments flowed into the eroded site and were blocked by an earthworks bund on the northern and eastern property boundaries during the time the assessment was undertaken (Bornhorst & Ward 2013). This bund was to remain in place until all downstream areas were at least 70% established. The formerly established areas to the west were reviewed both during site inspection and aerial photography, and it was shown that the areas appeared to be sufficiently vegetated, preventing issues with erosion.

Site surface drainage works were based generally on the following recommendations made in the study.

- Construct contour banks as per the maximum spacings on drawing provided in Figure 25; to direct runoff to the central overland flow paths provided and aid in preventing erosion.
- Allow downstream areas to establish first by implementing staged filling activities and stabilisation of areas from downstream to upstream and typically west to east.
- Leave upstream areas 1 m low at the stage boundary providing a stormwater catch pond and protecting early establishment downstream areas.
- Construct rock-lined flow channels and turfed flow paths within the site to direct runoff to either the existing dam in the south-eastern corner or existing vegetated areas within the site.
- Construct rock-check dams at the intersection of contour banks and the main channel lines.
- Undertake regular site reviews of the condition of flow paths.

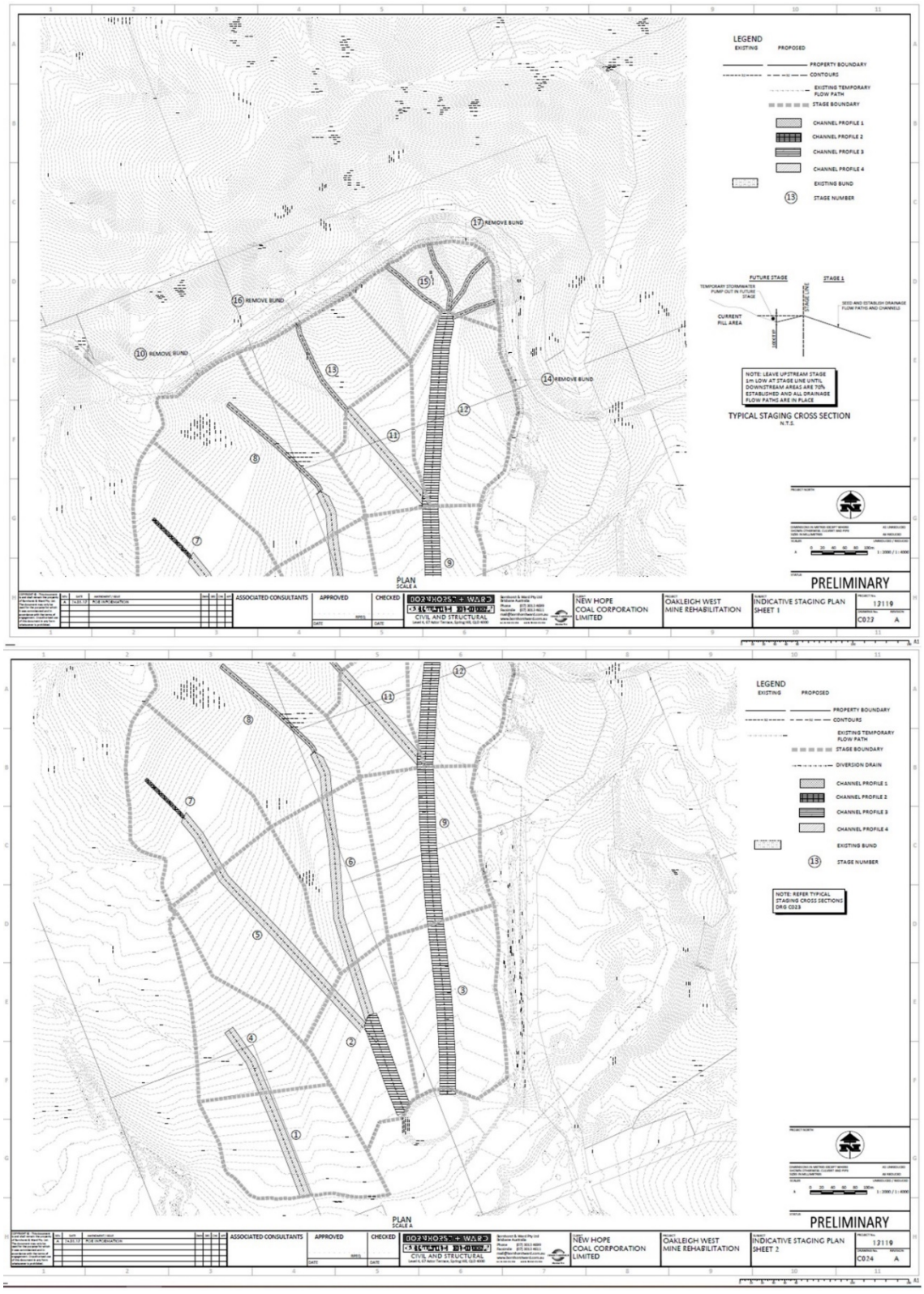

Figure 25: Drainage design for Oakleigh West

Surface water run-off is drained via the engineered flow paths into a series of water storage dams. Water quality monitoring has been conducted in each of these dams. Since the completion of site rehabilitation, water quality monitoring has been undertaken in Urry Road dam (OW21) and other dams in the seepage area near Urry Road (monitoring points OW40, OW41 and OW42). Water quality data was obtained from these dams between March 2017 and May 2021, where sufficient surface water was available. Historical water quality data is also available for OW21 (2010 – 2012). The available water quality data is discussed in section 3.5.7.5.

3.5.7.2 Oakleigh East - northern highwall

The northern highwall area currently drains into an existing pond, the North Cut Sediment Dam (OW01), adjacent to the tailings dam infill area which then discharges south into the eastern drain works area (refer to Figure 18). Outflow from this area is through the existing connection drain to the central drainage area (Figure 19). Overall, minimal bulk earthworks are proposed for remediation of the northern highwall.

Water quality monitoring from the North Cut Sediment Dam (OW01) (Figure 26) was undertaken on two occasions in 2017 with available water quality data discussed in section 3.5.7.5.

3.5.7.3 Oakleigh eastern drains

A summary of the design detail for the eastern drains area is provided in section 3.5.4.2. The Old Wash Plant Dam at the bottom of the catchment area has been retained to provide for sedimentation of flows from the upstream catchment. The hydraulic assessment undertaken assumed a 'worst case' scenario for bed shear stresses and flow velocities within the various constructed drains assessed.

Water quality monitoring from the Washplant/ROM Dam (OW04) (Figure 26) has previously been undertaken on three occasions in September 2017, December 2017 and May 2021. The available water quality data are presented in Table 18 and discussed in section 3.5.7.5.

3.5.7.4 Normanton pit

Adoption of a maximum 20% (11°) slope in the main rehabilitation area of Normanton is intended to address long-term erosion and scour for the Normanton rehabilitation area. The rehabilitation design incorporates an eastern 'catch' drain that collects runoff from adjacent undisturbed areas to the east via four existing road culvert crossings on Blakes Road, and directs flow to a central sediment pond prior to release from the area. The remainder of the Normanton rehabilitation area drains via a system of engineered graded banks and spine drains to an upstream sediment pond, which then cascades to the central sediment pond.

A combination of Grassroots^{TM} product and rock armouring has been applied to chutes and the main drain to help control erosion. Refer to Figure 20 for the drainage general layout of Normanton pit.

Water quality monitoring data from this recently rehabilitated area was first collected in May 2021. Water quality data will continue to be collected as outlined in section 3.7.

3.5.7.5 Existing water quality monitoring

Water samples from the existing monitoring points (as shown in Figure 26) were collected between March 2017 and May 2021, with analysis undertaken by Australian Laboratory Services (ALS) and Eurofins environmental testing laboratory. The water quality results are summarised in Table 17 and Table 18, and are compared against the recommended 'low risk' water quality trigger values for livestock drinking water (ANZECC & ARMCANZ 2000).

The results show that periodic exceedances of TDS occur at OW04 (Oakleigh East), OW43 (Normanton pre-rehabilitation) and OW21 (Oakleigh West). Sulphate levels have also been recorded above the 'low risk' trigger value at OW04 and OW21. pH values were recorded above the upper trigger value on two sampling occasions at OW01 (2017) and one at OW21 (2020). With the exception of OW04 and OW21, water quality data for pH and sulphate indicates the rehabilitated landforms are not currently producing saline runoff. Once the eastern drainage works have been completed, sufficient water quality sampling shall be undertaken

in the washplant dam (OW04) with the expectation that runoff from the final rehabilitated landform shall not be indicative of saline drainage.

Water quality investigations of data from the Urry Road site (OW21) are ongoing but elevated concentrations of TDS and sulphate suggest that this site may be associated with a natural seepage point (refer also section 3.7). The 'low risk' trigger value for TDS (4,000 mg/L) is the tolerance level at which beef cattle are not expected to suffer any adverse effects. Cattle are expected to adapt to TDS in the range of 4,000 – 5,000 mg/L ('medium risk') following initial reluctance or scouring. While TDS concentrations between 5,000 and 10,000 mg/L ('high risk') may be tolerated for short periods if introduced gradually, there is a risk of production losses or declining animal condition or health. For the most part, TDS concentrations in the retained water storages remain below the low and/or medium risk level. TDS values in the Urry Road dam periodically exceed the medium risk level. Monitoring of TDS and sulphate concentrations in water storage structures will continue as outlined in section 3.7.

All other parameters analysed, including heavy metals, fall below the 'low risk' trigger values for livestock drinking water (Table 17 and Table 18).

In summary, based on the available water quality data, rainfall runoff collected on site is generally considered suitable as drinking water by grazing cattle. Water quality in selected storages may be influenced by groundwater seeps rendering them periodically unsuitable as a drinking water source for beef cattle.

Table 17: Physicochemical water quality results compared to livestock drinking water 'low risk' trigger values

Sample ID	**Sample date**	**PhysicoChemical Parameter**					
		pH	**Electrical Conductivity (EC)**	**Total Dissolved Solids (TDS)**	**Suspended Solids (SS)**	**Turbidity**	**Sulphate (SO4)**
	Unit	**pH Unit**	**µS/cm**	**mg/L**	**mg/L**	**NTU**	**mg/L**
	Trigger value	**6-9**	**n/a**	**4,000**	**n/a**	**n/a**	**1,000**
Oakleigh East							
OW01	28/09/2017	**9.03**	1620	950	51	53.8	15
OW01	21/12/2017	**9.44**	1760	972	30	26.1	13
OW04	28/09/2017	8.4	6020	**4310**	11	15.9	980
OW04	21/12/2017	8.38	6560	**4120**	27	10.5	968
OW04	7/05/2021	8.4	360	**6300**	29	3.5	**2000**
Normanton							
OW43	13/09/2019	8.57	6740	**4540**	43	10.2	<1
OW43	7/05/2021	8.7	260	370	11	18	150
Oakleigh West							
OW40	31/03/2017	7.64	455	334	12	23.6	91
OW40	28/09/2017	8.24	917	679	11	12.2	240
OW40	21/12/2017	8.26	701	416	<5	2.1	136

Sample ID	Sample date	PhysicoChemical Parameter					
		pH	Electrical Conductivity (EC)	Total Dissolved Solids (TDS)	Suspended Solids (SS)	Turbidity	Sulphate (SO4)
	Unit	pH Unit	µS/cm	mg/L	mg/L	NTU	mg/L
	Trigger value	6-9	n/a	4,000	n/a	n/a	1,000
OW41	31/03/2017	7.57	230	168	34	63.4	29
OW41	28/09/2017	8.41	752	498	24	25.3	127
OW41	21/12/2017	8.35	799	449	12	7.9	98
OW42	31/03/2017	7.54	244	177	76	111	28
OW42	28/09/2017	8.79	670	517	48	73.9	29
OW42	21/12/2017	8.51	821	500	34	29.1	38
OW21	8/12/2011	7.5	760	n/a	n/a	n/a	n/a
OW21	14/12/2011	7.4	770	n/a	n/a	n/a	n/a
OW21	30/01/2012	7.2	690	n/a	26	n/a	n/a
OW21	1/02/2012	7.1	940	n/a	<1	n/a	n/a
OW21	5/03/2012	7.6	1300	n/a	19	n/a	n/a
OW21	7/03/2012	7.6	1200	n/a	4	n/a	n/a
OW21	4/06/2012	6.9	1000	n/a	10	n/a	n/a
OW21	21/12/2017	8.61	8850	**5410**	10	2.3	**1470**
OW21	09/10/2019	8.85	8710	**6480**	53	10.3	**1540**
OW21	05/12/2019	8.73	9090	**6700**	72	26.9	**1530**
OW21	22/07/2020	8.4	8000	**5200**	28	14	n/a
OW21	10/12/2020	**9.1**	10000	**7600**	24	16	**2400**
OW21	7/05/2021	8.6	160	**5100**	28	8.2	**1400**

Source: *ANZECC/ARMCANZ (2000) values for livestock drinking water quality Table 4.3.1.

Table 18: Site water quality analysis results compared to livestock drinking water trigger values

Parameter	Unit	Trigger value ('low risk')	Oakleigh East	Normanton		Oakleigh West				
	Sample ID		OW04	OW43	OW43	OW21	OW21	OW21	OW21	OW21
	Sample date		7/05/2021	13/09/2019	7/05/2021	09/10/2019	05/12/2019	22/07/2020	10/12/2020	7/05/2021
Physico-chemical										
pH	pH Unit	6-9	8.4	8.57	8.7	8.85	8.73	8.4	9.1	8.6
Electrical Conductivity (EC)	µS/cm	n/a	360	6740	260	8710	9090	8000	10000	160
Total Dissolved Solids (TDS)	mg/L	4000	6300	4540	370	6480	6700	5200	7600	5100
Suspended Solids (SS)	mg/L	n/a	29	43	11	53	72	28	24	28
Dissolved major ions										
Sulfate (SO4)	mg/L	1,000	2000	<1	150	1540	1530	1400	2400	1400
Nitrate as N	mg/L	400	< 0.02	<0.01	1.5	0.12	0.05	nd	< 0.02	< 0.02
Calcium	mg/L	1,000	240	32	14	62	24	55	30	47
Magnesium	mg/L	n/a	320	38	11	102	115	110	170	96
Total metals										
Aluminium	mg/L	5	< 0.05	<0.01	0.57	0.16	0.46	0.24	0.27	0.13
Arsenic	mg/L	0.5 up to 5	0.002	0.004	0.002	0.002	0.003	0.003	0.011	0.008
Cadmium	mg/L	0.01	< 0.0002	<0.0001	< 0.0002	<0.0001	<0.0001	< 0.0002	< 0.0002	< 0.0002
Chromium	mg/L	1	0.001	<0.001	< 0.001	<0.001	<0.001	0.034	< 0.001	< 0.001
Cobalt	mg/L	1	< 0.001	0.001	< 0.001	0.002	0.003	0.002	0.002	< 0.001

Parameter	Unit	Trigger value ('low risk')	Oakleigh East	Normanton		Oakleigh West				
	Sample ID		OW04	OW43	OW43	OW21	OW21	OW21	OW21	OW21
	Sample date		7/05/2021	13/09/2019	7/05/2021	09/10/2019	05/12/2019	22/07/2020	10/12/2020	7/05/2021
Copper	mg/L	1	0.008	0.001	0.005	<0.001	0.002	0.001	0.001	< 0.001
Lead	mg/L	0.1	< 0.001	<0.001	< 0.001	<0.001	<0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	n/a	0.009	0.323	0.007	0.042	0.065	0.078	0.059	0.032
Molybdenum	mg/L	0.15	0.036	0.007	0.007	0.016	0.016	0.017	0.014	0.016
Nickel	mg/L	1	< 0.001	0.001	< 0.001	0.005	0.005	0.009	0.003	< 0.001
Selenium	mg/L	0.02	0.009	<0.01	< 0.001	<0.01	<0.01	< 0.001	< 0.001	< 0.001
Silver	mg/L	n/a	< 0.005	<0.001	< 0.005	<0.001	<0.001	< 0.005	< 0.005	< 0.005
Uranium	mg/L	0.2	0.005	0.002	< 0.005	0.003	0.004	< 0.005	< 0.005	< 0.005
Vanadium	mg/L	n/a	< 0.01	<0.01	< 0.01	<0.01	<0.01	< 0.005	0.013	< 0.01
Zinc	mg/L	20	< 0.005	<0.005	< 0.005	<0.005	<0.005	< 0.005	< 0.005	< 0.005
Boron	mg/L	5	0.17	0.34	< 0.05	0.21	0.2	0.24	0.08	0.19
Iron	mg/L	n/a	< 0.05	0.17	0.58	0.2	0.53	0.42	0.14	0.16
Mercury	mg/L	0.002	nd	<0.0001	nd	<0.0001	<0.0001	< 0.0001	< 0.0001	nd

Source: *ANZECC/ARMCANZ (2000) values for livestock drinking water quality Table 4.3.1 and Table 4.3.2.

n/a – indicates this parameter has not been assigned a 'low risk' water quality trigger value under the livestock drinking water guidelines (ANZECC & ARMCANZ 2000).

nd – indicates no data is available for this parameter.

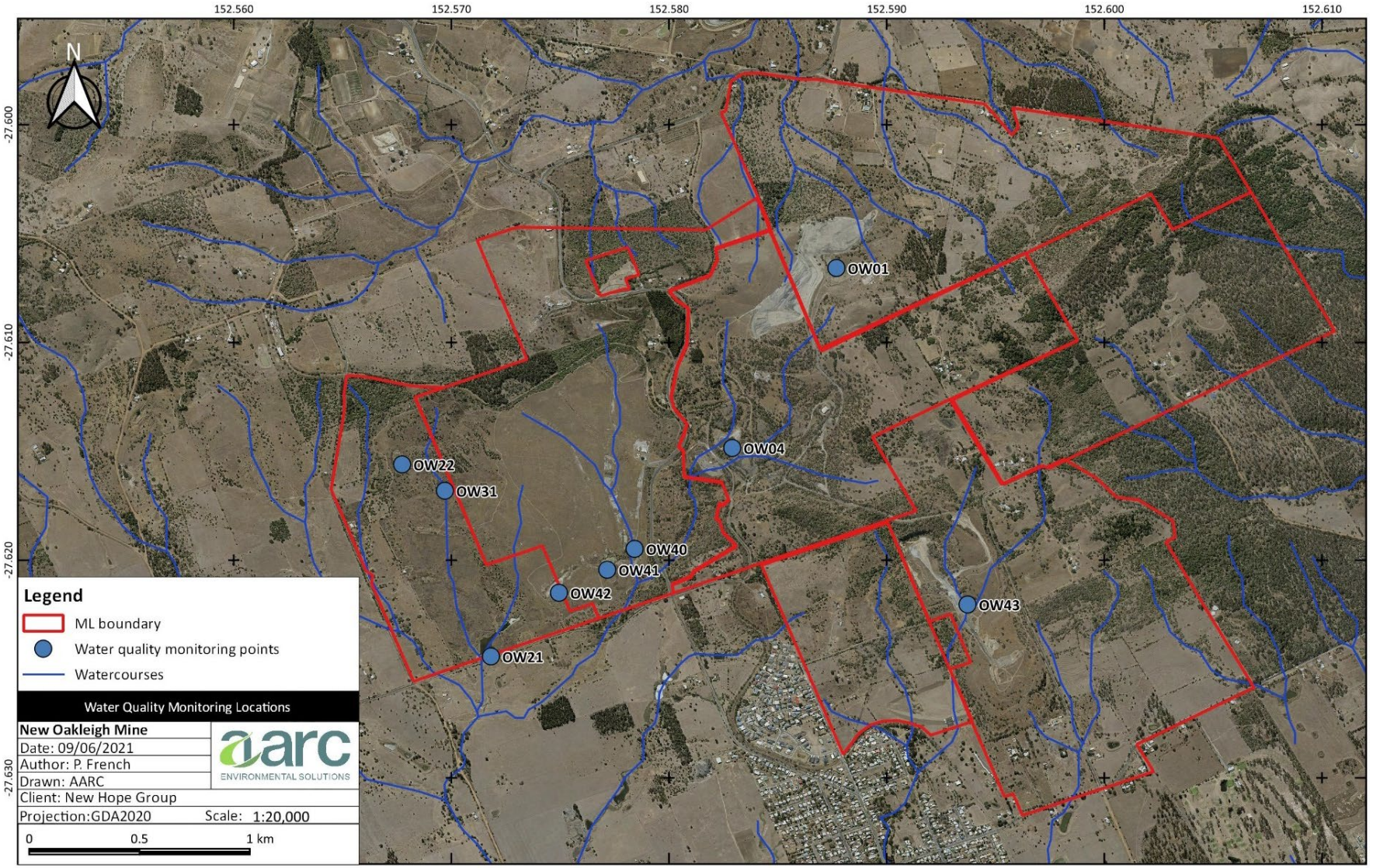

Figure 26: Water quality monitoring sites

3.5.8. Existing rehabilitation efforts

Rehabilitation of disturbed areas has been carried out progressively over the life of the Project as areas have become available, in accordance with the condition F2 of the EA. To date, 228.6 ha of the 278.0 ha total disturbance footprint has been rehabilitated or will be retained for the future use by the landowner (refer Figure 27). Table 19 summarises the revegetation timeline and activities undertaken at the Project site.

Table 19: Revegetation timeline

Year	Activity
Oakleigh East	
Prior to 1997	• Planting of native trees and shrubs from locally collected seed and tube stock (species list in 1997 PoO, p.15)
1999	• Rehabilitated land returned to grazing of cattle (pasture species list in 1999 PoO, p.12) • Planting of native trees and shrubs from locally collected seed and tube stock (species list in 1999 PoO, p.14)
2018-2019	Tailings Dam rehabilitation • Dewatering of Tailings Dam 1 • Capping of Tailings Dams 1 & 2 • Seeding of Tailings Dams 1 & 2
Oakleigh West	
2001	• 880 trees (1ha) planted in native ecosystem rehabilitation area (Plot A)
2002	• 1,000 trees (1.2ha) planted in native ecosystem rehabilitation area (Plot C)
2003-2004	• Planted selected areas with Rosewood Scrub species
2004-2005	• Seeded 11.3 ha
2005-2006	• Seeded 26.7 ha • 3,300 trees (11.3ha) of locally sourced Rosewood Scrub and other native plant species planted in the native ecosystem rehabilitation area (Plots B) and an extension to the protected patch of Rosewood Scrub (Plot D)
2006-2007	• Seeded 12.5 ha • 250 trees and shrubs planted in native ecosystem rehabilitation area
2007-2008	• Seeded 5.9 ha • Future native ecosystem 19.8 ha • Interim native ecosystem 12.5 ha • 13,310 (14.5 ha) trees and shrubs planted in native ecosystem rehabilitation area
2008-2009	• Seeded 16.8 ha • Future native ecosystem 7.1 ha • Interim native ecosystem 24.6 ha
2009-2010	• Seeded 27.4 ha • Future native ecosystem 3.8 ha • Interim Native Ecosystem 27.2 ha
2010-2011	• Seeded 21.8 ha • Future native ecosystem 2.9 ha • Interim native ecosystem 24.5 ha

Year	Activity
2011-2012	• Seeded 30.6 ha • Future native ecosystem 0.3 ha • Interim native ecosystem 22.4 ha
2012-2013	• Future native ecosystem 0.1 ha • Interim native ecosystem 18.9 ha
2013-2014	• Future native ecosystem 0.1 ha • Interim native ecosystem 15.6 ha
2014-2015	• Seeded 47.3 ha • Future native ecosystem 0.1 ha • Interim native ecosystem 15.1 ha
2015-2016	• Seeded 44.5 ha • Future native ecosystem 0.1 ha • Interim native ecosystem 14.4 ha
Normanton	
2019-2021	• Void backfilling • Contouring of in-pit spoil, southern spoil dump and drainage basins • Surface preparation • Seeding

Survival and growth rates in Plots B, C and D have been affected by the drought conditions to the extent that these areas are no longer proposed to form part of the 30 ha of native ecosystem PMLU prescribed in the EA.

3.5.8.1 Rehabilitation performance

Grazing rehabilitation monitoring commenced in 2005 within historic rehabilitation areas including the North Pit in-pit spoil and the Normanton waste rock dump (BTEQ 2005b). Monitoring continued annually across the Normanton grazing area until 2008. At times, the progress of the rehabilitation in comparison with the analogue site was found to be within the agreed acceptance criteria (BTEQ 2006). However, during subsequent years the monitoring results indicated the rehabilitation acceptance criteria were not met despite there being no significant difference between the rehabilitation and analogue sites. Throughout the monitoring program, recommendations were made to review the suitability of the completion criteria.

While the rehabilitation areas at Normanton have since been disturbed for the purpose of backfilling the Normanton void, the recommendations regarding the rehabilitation completion criteria have been considered in developing completion criteria for the PRCP.

In Oakleigh West, pasture was first sown in 2015 utilising the seed mix composition detailed in the Oakleigh West Rehabilitation: Cattle Grazing and Pasture Trial (NOC 2020). Grazing trials commenced at Oakleigh West in May 2020 with the objective of testing the ability of rehabilitated grazing pastures to meet sustainability and productivity conditions as prescribed in the EA.

Grazing strategies for the trial include a continuous grazing approach with a moderate set-stocking level. In total, 113 head of Black Angus heifers were initially introduced to the Oakleigh West area. No specific improvements (e.g., irrigation, fertiliser, re-seeding etc.) were made to the pasture either prior to or during the trial period.

An interim study was conducted approximately six months after the trial was initiated. A total of 110 heifers were weighed, and results showed an average gain of 0.62 kg/day, which was very close to the average daily weight gain of 0.7 kg/day for a heifer raised under ideal conditions (NSW DPI 2021).

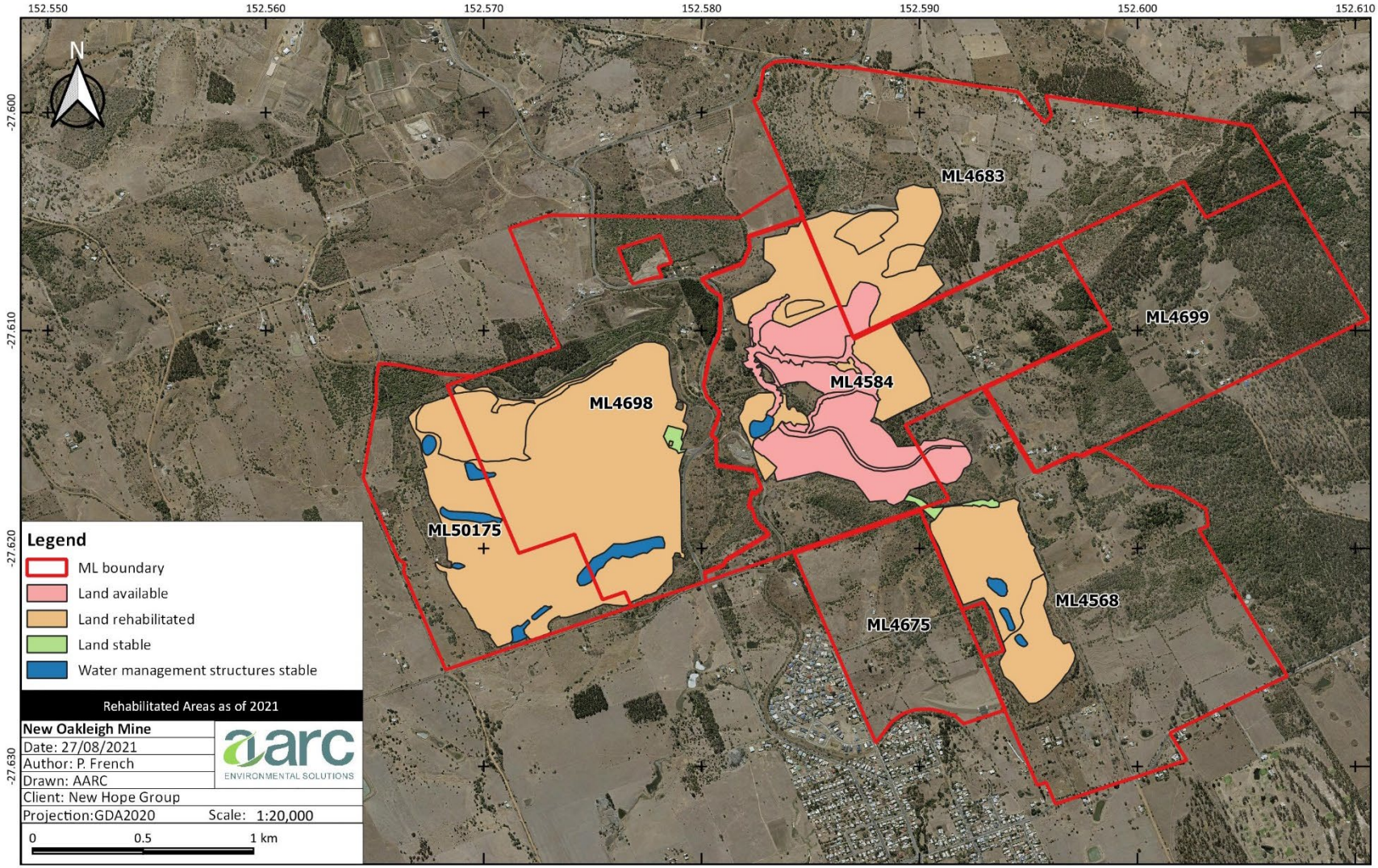

Figure 27: Rehabilitated areas to 2021

3.5.9. Rehabilitation milestone activities applicable to retained infrastructure (RA1)

3.5.9.1 RM2: Stable

The infrastructure nominated to be retained by the landholder includes a partially bitumen-sealed and gravel access track, concrete slabs, relocatable shed and an above ground diesel storage tank in Oakleigh West, and a section of access road between Normanton and Oakleigh East. These areas are being retained for access and future grazing management activities and are considered appropriate for this PMLU.

3.5.9.2 RM3: Achievement of target PMLU

Achievement of RM3 is subject, as a minimum, to the completion of a phase 1 contaminated land investigation undertaken by a suitably qualified person. When required, remediation activities will be undertaken and recorded, and notifications will be completed before RM3 is considered to be achieved.

A timeframe of approximately 10 years is proposed for RA1 to achieve RM3, aligning with the achievement of RM3 in adjoining rehabilitation areas (RA3 or RA7) and simplifying the relinquishment process.

3.5.10. Rehabilitation milestone activities applicable to water management structures (RA2)

3.5.10.1 RM2: Stable

The existing water management structures will be retained for their current purpose and are considered fit for purpose. Water quality results for monitoring conducted since 2017 indicates that exceedances of EC, TDS and sulphate do occur at times in the Urry Road dam (OW21) (known seepage collection site), and the Washplant dam (OW04) at Oakleigh East. All parameters analysed from other sites were below the 'low risk' trigger values for livestock drinking water (see section 3.5.7.5). The dams will continue to be monitored over the next ten years until the achievement of the nominated completion criteria can be demonstrated.

The total area of water management structures exceeds the 2 ha area specified in the EA. However, the proposed extent of retained water management structures is consistent with the pre- and post-mining land use and all structures will be transferred to the landholder in accordance with the landholder agreement authorising the retention of these structures.

3.5.10.2 RM3: Achievement of target PMLU

Achievement of RM3 will be determined based on the results of the monitoring and maintenance plan outlined in section 3.7 and the completion criteria described in Table 12.

A timeframe of approximately 10 years is proposed for RA2 to achieve RM3, aligning with the achievement of RM3 in adjoining rehabilitation areas (RA3 or RA7) and simplifying the relinquishment process.

3.5.11. Rehabilitation milestone activities applicable to In-pit spoil (RA3), tailings dams (RA4), Normanton mine disturbance (RA7), native ecosystem rehabilitation areas (RA8) and North mine disturbance (RA9)

3.5.11.1 RM1: Rehabilitated

These areas have previously undergone ground preparation and planting in accordance with the techniques described in section 3.5.6.3 but require ongoing maintenance, management and monitoring.

New Hope is required to restore 30 ha of native ecosystem. A 15 ha native ecosystem rehabilitation area in Oakleigh West (see Figure 13) has been revegetated with native trees and shrubs. Another 15 ha area

nominated as native ecosystem in Oakleigh East (see Figure 13) has also previously undergone revegetation using native trees and shrubs. These areas will undergo weed control and infill planting using native trees and shrubs in accordance with the species selection and sourcing as discussed in section 3.5.6.1 and section 3.5.6.2. The remainder of these RAs will be a grazing PMLU.

In the event that legacy underground mining infrastructure is identified while undertaking rehabilitation works, the infrastructure will be surveyed and sealed appropriately.

3.5.11.2 RM2: Stable

Demonstration of the achievement of RM2 will be determined based on the results of the monitoring and maintenance plan outlined in section 3.7. Following rehabilitation, areas will be subject to monitoring to assess the progress of rehabilitation and demonstrate the achievement of the nominated completion criteria.

3.5.11.3 RM3: Achievement of target PMLU

Demonstration of achievement of RM3 will be determined based on the results of the monitoring and maintenance plan outlined in section 3.7 and the completion criteria described in Table 12.

3.5.12. Rehabilitation milestone activities applicable to North Highwall (RA5)

3.5.12.1 RM1: Rehabilitated

This area has remained largely bare since extensive rehabilitation was undertaken in other parts of Oakleigh East over 20 years ago. The north highwall will undergo further rehabilitation work to implement surface erosion protection measures combined with revegetation. The bare area will be covered with a suitable depth of soil/weathered material being revegetated with pasture species. No further bulk earthworks are planned for this area, except in relation to those associated with establishing or re-establishing drainage paths for the run-off to the south and east. For full discussion and assessment history see section 3.5.4.2.

During the period following active revegetation, access to the rehabilitated areas will be limited to monitoring, management and rehabilitation maintenance activities. Fencing of rehabilitated areas has been recommended to prevent access by fauna or livestock. The north highwall area will be subject to ongoing monitoring, maintenance and management (see section 3.5.6.4) until it is deemed stable.

3.5.12.2 RM2: Stable

Following rehabilitation, areas will be subject to monitoring to assess the progress of rehabilitation and demonstrate the achievement of the nominated completion criteria. Demonstrated achievement of RM2 will be based on the results of the monitoring and maintenance plan outlined in section 3.7.

3.5.12.3 RM3: Achievement of target PMLU

Achievement of RM3 will be determined based on the results of the monitoring and maintenance plan outlined in section 3.7 and the completion criteria described in Table 12.

3.5.13. Rehabilitation milestone activities applicable to the Eastern Drains (RA6)

3.5.13.1 RM1: Rehabilitated

The eastern drain has previously undergone ground preparation and planting in accordance with the techniques described in section 3.5.6.3 for a grazing outcome. However, extensive remedial work is planned for this area. Bulk earthworks will be undertaken to create a drain that will discharge through the pool adjacent to the existing ROM pad at Rosewood-Marburg Road. The proprietary Grass-Roots^{TM} product or

similar will be utilised for the majority of the main drain areas along with rock armouring at the downstream ends to control flow velocities and erosion. Work is expected to be complete by August 2027. The detail of the eastern drains design has been included in Section 3.5.4.2.

In the event that legacy underground mining infrastructure is identified while undertaking rehabilitation works in this area, the infrastructure will be surveyed and sealed appropriately.

3.5.13.2 RM2: Stable

Following rehabilitation, areas will be subject to monitoring to assess the progress of rehabilitation and demonstrate the achievement of the nominated RM2 completion criteria. Achievement of RM2 will be determined based on the results of the monitoring and maintenance plan outlined in section 3.7.

3.5.13.3 RM3: Achievement of target PMLU

Achievement of RM3 will be demonstrated based on the results of the monitoring and maintenance plan outlined in section 3.7 and the completion criteria described in Table 12.

3.6 Risk assessment

3.6.1. Risk assessment requirements

Section 1236C(1)(f) of the EP Act requires the PRCP to identify the risks, for each PMLU, of a stable condition not being achieved and how the applicant intends to manage or minimise the risk.

A risk assessment has been carried out in accordance with the following standards:

- AS/NZS ISO 31000:2018 Risk management – Guidelines; and
- HB203:2012 Managing environment-related risk.

3.6.2. Risk assessment process

Any risk assessment needs to be undertaken with consideration of the scope, context and criteria relevant to the assessment. For this risk assessment, the following scope and purpose was discussed and agreed to:

> *The purpose of this risk analysis is to identify and assess the risks of a stable condition for land not being achieved for the agreed PMLUs nominated and any related potential for environmental harm. The risk analysis will also identify the approaches to be taken by the Project to manage and minimise any high-ranking risks identified.*

For this risk assessment, risk scenarios (or 'threats') were identified and considered for each rehabilitation area associated with the Project. The causes attributable to each risk scenario were documented as well as the potential impacts. Existing controls were noted, defined as those reasonably expected to be in place for a Project of this nature and having appropriate and contemporary management systems. Each risk scenario was then assessed with respect to health, safety, the environment and compliance against the risk assessment schema outlined in section 3.6.3. The risk assessment was developed through a workshopping process including key persons responsible for mine planning and environmental management.

3.6.3. Risk assessment schema

Identified risks were classified in accordance with New Hope's risk classification schema, which is described below. The risk assessment schema used is comparable to those used widely within the mining industry and comprises the following components:

- a control effectiveness ranking (Table 20) used for assessing the operational controls expected to be in place for a project of this type;
- a likelihood of exposure descriptors table (Table 21); and
- a consequence classification descriptors table (Table 22) intended to guide a consistent assessment of consequence.

Following a consensus determination of likelihood and consequence, the risk level was determined using the matrix shown in Table 23. For any risks classified as 'high' or above, mitigation and management measures were identified and documented. Mitigation and management measures were also documented for some lower-level risks.

Table 20: Control effectiveness ranking

Control Rank	Description	Guidance
C1	Substantially effective/adequate design	Controls are considered adequately designed and are operating effectively on almost all occasions
C2	Mostly effective/adequate design	Controls are considered adequately designed and are operating effectively on most occasions
C3	Inadequate design/partially effective	Controls are considered inadequately designed or are only operating to partial effectiveness on most occasions
C4	No controls/ineffective	There are no controls designed or the existing controls are operating ineffectively on all occasions

Table 21: Likelihood of exposure to hazard descriptors

Likelihood level	**Explanation**
5 – Almost certain	Likely to occur in most circumstances multiple times in a year
4 – Likely	Will probably occur in most circumstances every 1-3 years
3 – Possible	Might occur at sometime over a 3-10 year period
2 – Unlikely	Could occur at sometime within a 10-50 year timeframe and has occurred in industry
1 – Rare	May only occur in exceptional circumstances within a 50-100 year timeframe

Table 22: Consequence classification descriptors

Impact types	Consequences				
	Negligible (1)	**Minor (2)**	**Moderate (3)**	**High (4)**	**Catastrophic (5)**
Financial impacts (includes damage)	Less than $100,000	$100,000–$1 Million	$1–$10 Million	$10–$30 Million	Greater than $30 Million
Business interruption	Closure of a number of days (less than 1 week)	Closure 1–2 weeks	Closure 2–4 weeks	Closure 1–3 months	Permanent loss or closure of greater than 3 months
Capital Projects	Less than 2% budget or schedule overrun	2–5% budget or schedule overrun	5–10% budget or schedule overrun	10–15% budget or schedule overrun	Greater than 15% budget or schedule overrun. Failure to complete project
Reputation	Isolated complaints	Local community issue with limited stakeholder involvement	Local community issue with political involvement. Local media coverage	State/local community issue with key stakeholder attention. National Media coverage	Withdrawal of Stakeholder support e.g. includes significant national or international media coverage
Legal / compliance	Breach of approval, permit, licence or legislation which is administrative. No regulatory action taken	Breach of approval, permit, licence or legislation with likely penalty less than $5,000 Civil settlement or court order less than $10,000	Breach of approval, permit, licence or legislation with likely penalty $5,000 to $10,000 Civil settlement or court order $10,001 to $100,000	Breach of approval, permit, licence or legislation with likely penalty $10,000 to $100,000 Civil settlement or court order $100,001 to $1 Million Prosecution of Personnel/Manager with potential criminal conviction Significant interruption to a site (e.g. temporary suspension of 'licence to operate' a site)	Breach of approval, permit, licence or legislation with likely penalty $100,000 or more Civil settlement or court order greater than $1 Million Prosecution of Directors/Officers with potential criminal conviction or jail. Loss of 'licence to operate' a site

Impact types	Consequences				
	Negligible (1)	**Minor (2)**	**Moderate (3)**	**High (4)**	**Catastrophic (5)**
Health	Exposure to health hazard/agent (subjective symptoms) with potential to result in first aid treatment	Exposure to health hazard/agent reversible health impairment	Exposure to health hazard/agents (exceeding OEL) with the potential to result in days lost due to OII and/or PI >30%	Exposure to health hazard/agents (significantly exceeding OEL) with the potential to result in PI <30% or single fatality	Exposure to health hazard /agents (significantly exceeding OEL) with the potential to result in multiple single fatalities and/or PI <30% of more than 1 person
Safety	First Aid Injury (FAI) Report Only included	Medical Treatment Injury (MTI) or Restricted Work Injury (RWI)	Lost Time Injury (LTI)	Single fatality	Multiple fatalities
Environment	Nil to minor remediation (typically a shift). No adverse impact on environment	Near-source confined and short-term reversible impact (typically <week)	Near-source confined and temporary reversible impact (typically a month)	Impact that is unconfined and requiring long-term recovery, leaving residual damage (typically a year)	Impact that is widespread, unconfined and requiring long-term recovery, leaving major residual damage (typically years)

Note: Health impact definitions Used: Occupational Exposure Level (OEL); Occupational Injury/ Illness (OII); Permanent Impairment (PI)

Table 23: Risk level classification matrix

	Explanation		Risk rating				
			Negligible	Minor	Moderate	High	Catastrophic
Likelihood	Likely to occur in most circumstances multiple times in a year	**Almost certain**	M-5	H-10	H-15	E-20	E-25
	Will probably occur in most circumstances every 1–3 years	**Likely**	M-4	M-8	H-12	E-16	E-20
	Might occur at some time over a 3–10-year period	**Possible**	L-3	M-6	H-9	H-12	H-15
	Could occur at sometime within a 10–50-year timeframe and has occurred in industry	**Unlikely**	L-2	M-4	M-6	M-8	H-10
	May only occur in exceptional circumstances within a fifty-to-hundred-year timeframe	**Rare**	L-1	L-2	L-3	M-4	M-5

3.6.4. Risk assessment outcomes and management

Detailed risk assessments outcomes are provided in Appendix D. For the Project, a total of 32 individual risk scenarios were identified resulting in:

- no risk scenarios classified as 'extreme';
- one risk scenario classified as 'high';
- 30 classified as 'medium'; and
- one classified as 'low'.

A summary of risk outcomes is shown in Table 24.

Table 24: Risk assessment for rehabilitation works associated with the Project

Rehabilitation area	**Risk level**				**Total**
	Low	**Medium**	**High**	**Extreme**	
Waste rock dump(s) (incl. tailings caps, highwalls)	1	9	1	0	**11**
Capped tailings disposal areas	0	9	0	0	**9**
Water management structures	0	3	0	0	**3**
Mine built infrastructure	0	7	0	0	**7**
Legacy underground mining	0	2	0	0	**2**
Totals	**1**	**30**	**1**	**0**	**32**

The risk scenario classified as 'high' related to not obtaining a sufficient density and/or diversity of vegetation within the native ecosystem PMLU. Management measures identified as appropriate for lowering this risk classification included:

- monitoring and assessment of rehabilitation areas; and
- undertaking modification and improvement works as required based on the findings of the monitoring and maintenance program.

3.7 Monitoring and maintenance

For the purpose of developing the PRCP schedule, three rehabilitation milestones have been proposed as being applicable to the Project. The PRCP Guideline (DES 2021) requires consideration of measures to be undertaken to demonstrate that milestones and milestone criteria have been achieved. Given the closure status of the Project, as a general principle, NOCs environmental team will be charged with ensuring compliance with the milestone schedule.

To date, all areas of Normanton and Oakleigh West have undergone some form of rehabilitation, although most require ongoing management and maintenance, or further rehabilitation works to meet contemporary rehabilitation standards. While most of the land in Oakleigh East has been subjected to some past

rehabilitation, the areas that are proposed to be re-worked to address specific drainage and other issues, is effectively now available for that rehabilitation purpose, with planning and scheduling currently in process.

Significant rainfall events, localised flooding, fire, drought, pest species outbreaks or other factors may result in a requirement to conduct remedial activities in rehabilitated areas beyond general maintenance and planned remediation works. If maintenance is required, a maintenance plan will be developed that properly assesses the risks of re-entering a rehabilitated area with earthmoving equipment, the sourcing of soils and topsoil, impacts on planned drainage of the site, erosion controls and revegetation methods.

Table 25 provides a summary of the measures to be undertaken with respect to determining the achievement of each rehabilitation milestone. Determination of the boundary of an area reaching a specified rehabilitation milestone at a given point in time, where this is other than a discrete point or item of infrastructure, will utilise standard survey techniques, including a land-based survey and an airborne survey at an appropriate frequency—nominally annually—to achieve satisfactory geolocation of areas.

Table 25: Rehabilitation milestone management and monitoring measures

Rehabilitation milestone	Description / criteria	Proposed management / monitoring measure(s)
RM1: Rehabilitated	Applicable to in-pit spoil, native ecosystem rehabilitation area, tailings dam, north highwall, eastern drain, North mine disturbance and Normanton mine disturbance. Includes profiling, application of topsoil or other material such as biosolids, surface preparation and seeding and/or planting. RM1 is considered to be met when seeding and/or planting is complete, with the understanding that further works may be necessary to meet contemporary rehabilitation standards and the conditions stipulated in the EA, including remedial works for RA5 and RA6, and additional planting of native ecosystem PMLU.	Regular meetings will be held between the mining and environment team to track the progress of areas subject to rehabilitation. Rehabilitation activities shall include: • removal of mine infrastructure, equipment or materials not required for the PMLU; • remediation of contaminated materials or contaminants; • appropriate landform surface preparations (e.g., bulk earthworks, profiling and contour ripping, application of topsoil or other material such as biosolids); and • revegetation (i.e., seeding, planting or natural recruitment). Ongoing rehabilitation area management: • visual inspections to determine maintenance requirements; • repair of erosion prone areas; • maintenance of sediment and erosion control structures; • application of supplementary topdressing materials, where required; • weed and grass suppression, supplementary watering when and where required, management of cattle grazing; • re-seeding or additional planting and/or application of fertiliser in poorly performing areas; • infill planting throughout designated 15 ha native ecosystem area at Oakleigh West; • Weed control and infill planting throughout designated 15 ha native ecosystem area at Oakleigh East (see Figure 13); • remedial works on the eastern drains and north highwall (see section 3.5.4.2). Monitoring of new rehabilitation areas (including the eastern drains revegetation) to be conducted annually for the first three years followed by biennial monitoring. Biennial (or more often as required) surveys of rehabilitated areas will be conducted to monitor progress of rehabilitation against the completion criteria and to determine when land can be transitioned to RM2.

Rehabilitation milestone	Description / criteria	Proposed management / monitoring measure(s)
RM2: Stable	Applicable to all RAs. RM2 is considered to be met when the area is rehabilitated (where applicable), safe, stable and non-polluting as per the completion criteria in Table 12.	Biennial (or more often as required) field surveys will be conducted to monitor progress of grazing and native ecosystem PMLU rehabilitation areas against the completion criteria and to determine when land can be transitioned to RM3. Field survey monitoring may be supplemented with drone and satellite data analysis. Water quality monitoring will be conducted annually, in accordance with the Monitoring and Maintenance Plan (Appendix G). Assessments to be undertaken to demonstrate the achievement of RM2 shall include: • Land suitability assessment; and • Hazards, safety and stability assessment of all retained structures and landforms.
RM3: Achievement of target PMLU	Applicable to all RAs. RM3 is considered to be met when the area is safe, stable, non-polluting and sustainable as per the completion criteria in Table 12, and is able to be transitioned to progressive certification.	A combination of field surveys, drone and satellite imagery monitoring will be utilised as detailed in the Monitoring and Maintenance Plan (Appendix G). The following assessments will be undertaken to demonstrate that the land has achieved RM3: • closure post-mining soil and land suitability assessment; • vegetation and erosion assessment to be provided in a final rehabilitation report; • assessment of carrying capacity that demonstrates sustainable grazing outcome; • surface water assessment incorporating all water quality monitoring data obtained throughout the rehabilitation and closure period; • contaminated land assessment; and • hazards, safety and stability assessment of all retained structures and landforms.

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A. PRCP Schedule

Post-mining land uses (PMLU)										
Rehabilitation area	RA1									
Relevant activities	Retained infrastructure									
Total rehabilitation area size (ha)	2									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Retained infrastructure									
Date area is available	Pre-2021	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx
Cumulative area available (ha)	2									
Milestone completed by	10/12/32	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1										
RM2	2									
RM3	2									

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA2									
Relevant activities	Water Management Structures									
Total rehabilitation area size (ha)	7.8									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Sediment and water supply dams									
Date area is available	Pre-2021	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx
Cumulative area available (ha)	7.8									
Milestone completed by	10/12/32	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1										
RM2	7.8									
RM3	7.8									

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA3									
Relevant activities	In-pit Spoil									
Total rehabilitation area size (ha)	112.7									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Grazing									
Date area is available	Pre-2021		10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx
Cumulative area available (ha)	112.7									
Milestone completed by	10/12/26	10/12/32	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	112.7									
RM2	112.7									
RM3		112.7								

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA4									
Relevant activities	Tailings Dam									
Total rehabilitation area size (ha)	4.5									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Grazing									
Date area is available	Pre-2021		xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Cumulative area available (ha)	4.5									
Milestone completed by	10/12/27	10/12/36	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	4.5									
RM2	4.5									
RM3		4.5								

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA5									
Relevant activities	North Highwall									
Total rehabilitation area size (ha)	2									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Grazing									
Date area is available	Pre-2021		xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Cumulative area available (ha)	2									
Milestone completed by	10/12/30	10/12/35	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	2									
RM2	2									
RM3		2								

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA6									
Relevant activities	Eastern Drain									
Total rehabilitation area size (ha)	34.3									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Grazing									
Date area is available	Pre-2021			10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx
Cumulative area available (ha)	34.3									
Milestone completed by	10/12/27	10/12/32	10/12/36	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	34.3									
RM2		34.3								
RM3			34.3							

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA7									
Relevant activities	Normanton Mine Disturbance									
Total rehabilitation area size (ha)	36									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Grazing									
Date area is available	Pre-2021		xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Cumulative area available (ha)	36									
Milestone completed by	10/12/27	10/12/32	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	36									
RM2	36									
RM3		36								

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA8									
Relevant activities	Native Ecosystem Rehabilitation Area									
Total rehabilitation area size (ha)	30.2									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Native ecosystem									
Date area is available	Pre-2021				10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx	10/12/xxxx
Cumulative area available (ha)	30.2									
Milestone completed by	10/12/27	10/12/30	10/12/32	10/12/57	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	30.2									
RM2		15.1	30.2							
RM3				30.2						

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Post-mining land uses (PMLU)										
Rehabilitation area	RA9									
Relevant activities	North Mine Disturbance									
Total rehabilitation area size (ha)	48.4									
Commencement of first milestone: <insert milestone reference>	Commenced prior to PRCP implementation									
PMLU	Grazing									
Date area is available	Pre-2021		xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Cumulative area available (ha)	48.4									
Milestone completed by	10/12/26	10/12/32	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx	xx/xx/xxxx
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	48.4									
RM2	48.4									
RM3		48.4								

1) Insert new columns to the yellow table to include further rehabilitation milestone dates.
2) Insert new columns to the blue table to match rehabilitation milestone dates.
3) Insert new rows to the blue table to include additional rehabilitation milestone references.
4) Insert the relevant number in the "Milestone reference" column (i.e. RM1).

Milestone reference	Rehabilitation milestone	Milestone criteria
RM1	Rehabilitated	**Absence of mine infrastructure equipment and materials not required for the PMLU:** •All non-required services disconnected and removed •all non-required concrete, bitumen and gravel removed •all non-required operational pipelines drained and removed •all fencing that is not part of PMLU requirements removed •all non-required buildings demolished and/or removed •all machinery and equipment removed •all non retained surface water drainage infrastructure removed •all rubbish removed **Absence of contaminating materials/ contaminants** •Where required or applicable, contamination is remediated or removed **Evidence of appropriate landform surface preparation (contour ripping, presence of topdressing, application of amelioration materials where required). Only applicable to rehabilitation post 2021.** •All bulk earthworks and landform works completed •Sufficient topdressing material (topsoil or a suitable topsoil substitute) spread over reshaped surfaces •ameliorants have been applied where required to improve soil quality characteristics •visible evidence of ripping/discing along the contour (not applicable to historical rehabilitation areas) **Revegetation (seeding, planting or acceptable natural recruitment); seed germination and development of groundcover establishment** •Records of seeding/planting at design rates/densities •rehabilitation monitoring data demonstrating successful revegetation •Evidence of target germination rates, planting success and recruitment from initial monitoring
RM2	Stable	**Stable landform development through acceptable final landform slopes (i.e. as designed); geotechnical study completed by a suitably qualified person assessing the factor of safety for all final landforms; and drainage design by suitably qualified person** •90% of the final landform achieves slope gradients of 30% or less; and 80% of the final landform achieves slope gradients of 20% or less •landform construction of north highwall area (RA5) meets design criteria of slopes <40% with the exception of slopes in area A, which may exceed 40% •RA5 north highwall area vegetated and assessed by a suitably qualified person as stable with a minimum FOS of 1.5 •constructed landform in the eastern drainage works area (RA6) meets design criteria of maximum slope gradient of 20% •RA4 Tailings Dams assessed by a suitably qualified person as stable
RM2 (continued)	Stable (Grazing PMLU)	•Vegetation groundcover exceeds the 70th percentile of reference sites •erosion classification (per the Monitoring and Maintenance Plan (MM Plan)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites •no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance •Retained storage water quality parameters (as defined in the MM Plan) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000) with the exception of TDS measured at Urry Road dam (OW21). At this water storage the livestock 'high risk' trigger values for TDS will apply, unless sufficient data is available and demonstrates that Urry Road water quality has no detrimental impact on the TDS values of the Bremer River as measured at Station 143107A

RM2 (continued)	Stable (Native Ecosystem PMLU)	•Monitoring shows key species are present including Crows ash (Flindersia australis), Brigalow (Acacia harpophylla) and Whitewood (Atalaya salicifolia) •≥ 35% of Foliage Projective Cover (FPC) (T1 canopy cover) at analogue site(s) •landform is deemed safe for fauna •landform construction achieves suitable slope gradients of 30% or less •erosion classification (per the MM Plan) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites •no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance
RM2 (continued)	Stable (Water Storage PMLU)	•Surface water overflows from retained storage, Urry Road dam (OW21) meet the following criteria: - pH: 6.5-9.0; and - TDS: 10,000 mg/L; or - surface water quality data demonstrates Urry Road dam water quality has no detrimental impact on the pH and TDS values of the Bremer River as measured at Station 143107A •Surface water overflows from all other retained storages meet the following criteria: - pH: 6.5-9.0; and - TDS: 4,000 mg/L •Retained storage water quality for other parameters (per the MM Plan (Appendix F)) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000).
RM2 (continued)	Stable (Retained Infrastructure PMLU)	•No recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance •landform construction achieves slope gradients of ≤20% with the exception of slopes constructed in excess of 33% to achieve synergy with surrounding topography
RM3	Achievement of target PMLU (sustainable)	**Vegetation cover and diversity based on data acquired through the Rehabilitation Monitoring and Maintenance Plan (applicable only to Grazing and Native Ecosystem PMLUs); Land suitability assessment by an appropriately qualified and experienced person (applicable only to Grazing PMLU); Erosion classification determined based on data acquired through the Rehabilitation Monitoring and Maintenance Plan (applicable only to Grazing, Native Ecosystem and Retained Infrastructure PMLUs); Acceptable surface water quality based on water quality monitoring program (applicable only to Water Storage PMLU); Contaminated land assessment to demonstrate no residual contamination (applicable only to Grazing and Native Ecosystem PMLUs); Hazard and Safety Assessment by suitably qualified person (applicable to all PMLUs)**
RM3 (continued)	Achievement of target PMLU (sustainable) (Grazing PMLU)	•provide a final rehabilitation report including monitoring records •assessment of carrying capacity by suitably qualified person demonstrates a sustainable grazing outcome has been achieved •> 75% of groundcover vegetation comprises recognised pasture species; •relevant land capability class III / VIII achieved •erosion classification (per the MM Plan (Appendix F)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites •no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance
RM3 (continued)	Achievement of target PMLU (sustainable) (Native Ecosystem PMLU)	•Key species present including Crows ash (Flindersia australis), Brigalow (Acacia harpophylla), Whitewood (Atalaya salicifolia) •≥ 50% of number of native flora species/ha as present at analogue sites •≥ 70% of the T1 canopy height at analogue site(s) •≥ 50% of FPC (T1 canopy cover) at analogue site(s) •landform is deemed safe for fauna •evidence of low risk of land contamination via a contaminated land assessment report •erosion classification (per the MM Plan (Appendix F)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites •no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance

RM3 (continued)	Achievement of target PMLU (sustainable) (Water Storage PMLU)	•No regulated structures to be retained •all retained water storages (banks and spillways) to be assessed for safety and function by an appropriately qualified person •Surface water overflows from retained storage, Urry Road dam (OW21) meet the following criteria: - pH: 6.5-9.0; and - TDS: 10,000 mg/L; or - surface water quality data demonstrates Urry Road dam water quality has no detrimental impact on the pH and TDS values of the Bremer River as measured at Station 143107A • Surface water overflows from all other retained storages meet the following criteria: - pH: 6.5-9.0; and - TDS: 4000 mg/L •Retained storage water quality for other parameters (per the MM Plan (Appendix F)) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000)
RM3 (continued)	Achievement of target PMLU (sustainable) (Retained Infrastructure PMLU	•Final landform survey confirms no built structures remain other than those that form part of a landholder agreement •no recorded erosion classifications of 'Severe' or 'Extreme' •landform construction typically achieves slope gradients of ≤20%, with the exception of slopes constructed in excess of 33% to achieve synergy with surrounding natural topography
RM3 (continued)	Achievement of target PMLU (sustainable) (all PMLUs)	•Hazard and Safety Assessment demonstrates hazards in rehabilitation areas are of a similar type and not significantly different to hazards in neighbouring similar PMLUs (i.e. low risk)

1) Insert new rows below the table to record more Rehabilitation Area Milestones for the project
2) Ensure all Rehabiitation Milestones recorded in this table align with those included in the RA sheets in this form.
3) See the PRCP guideline before developing site-specific Rehabilitation Area Milestones

Milestone reference	Management milestone	Milestone criteria
MM1		
MM2		
MM3		
MM4		
MM5		
MM6		
MM7		
MM8		
MM9		
MM10		

1) Insert new rows below the table to record more Improvement Area Milestones for the project
2) Ensure all Management Milestones recorded in this table align with those included in the IA sheets in this form.
3) See the PRCP guideline before developing site-specific Improvement Area Milestones

B. PRCP Reference Map and Final Site Design Map

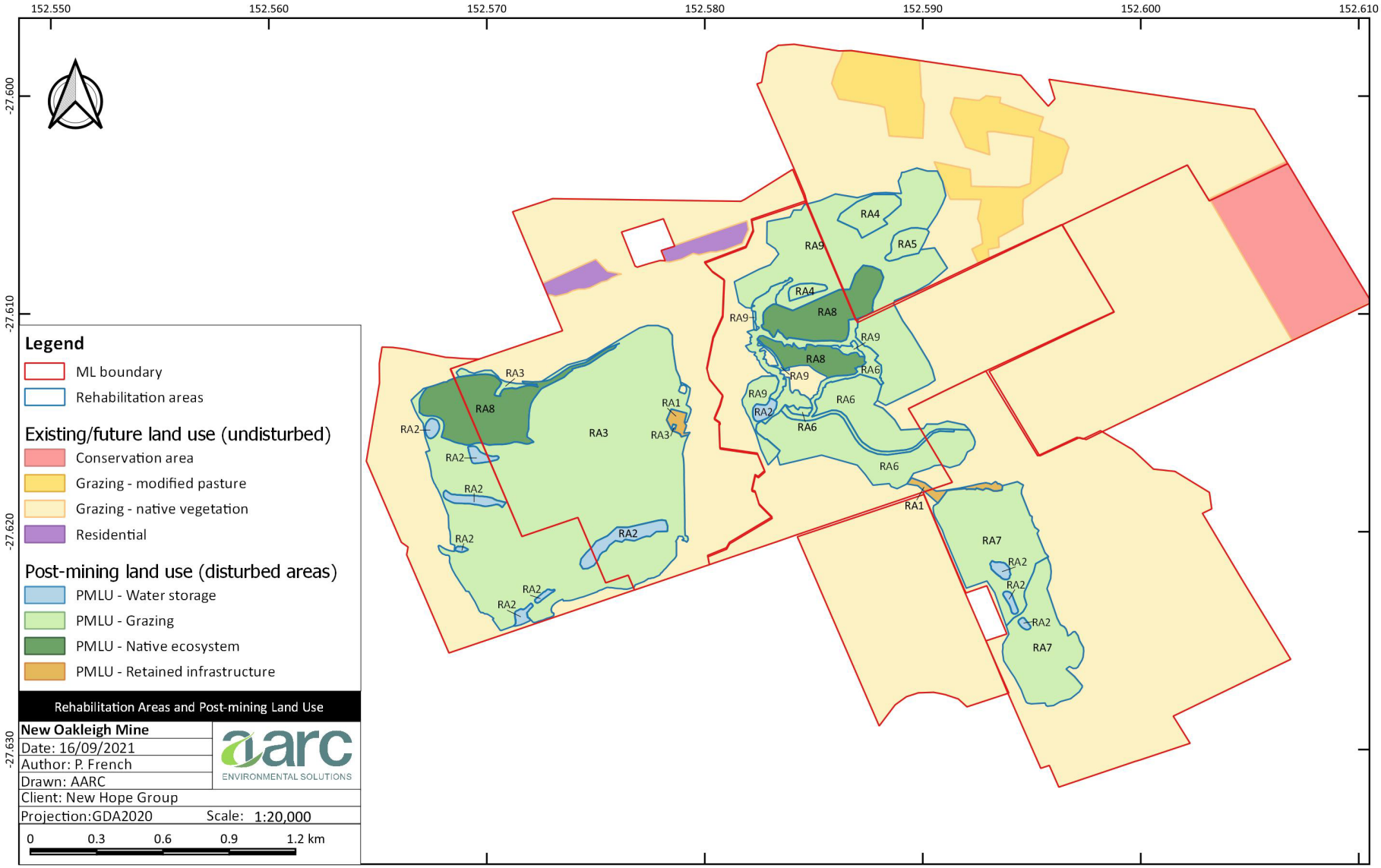

Figure 1: Reference Map

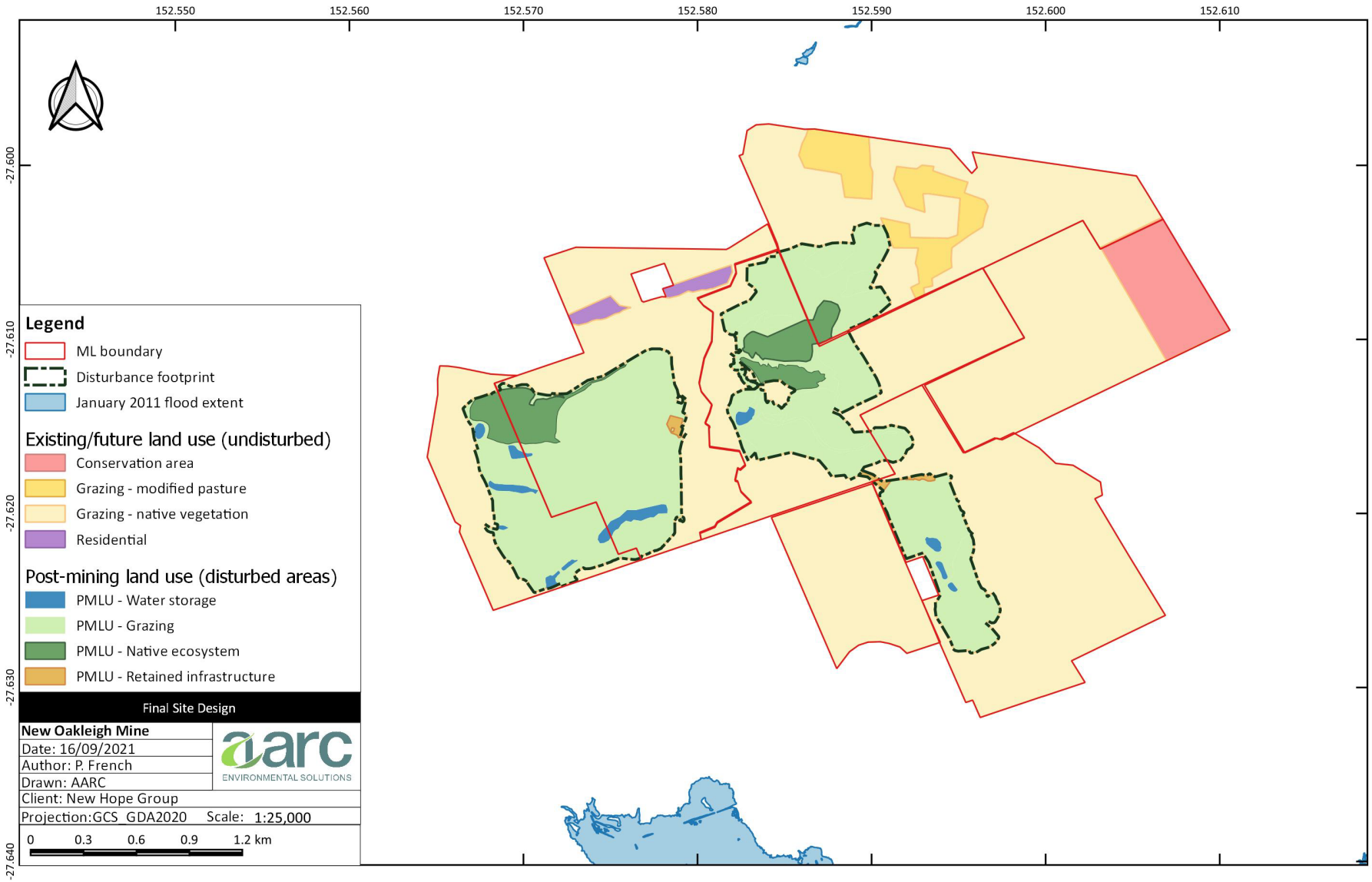

Figure 2: Final site design

C. Schedule Stage Plans

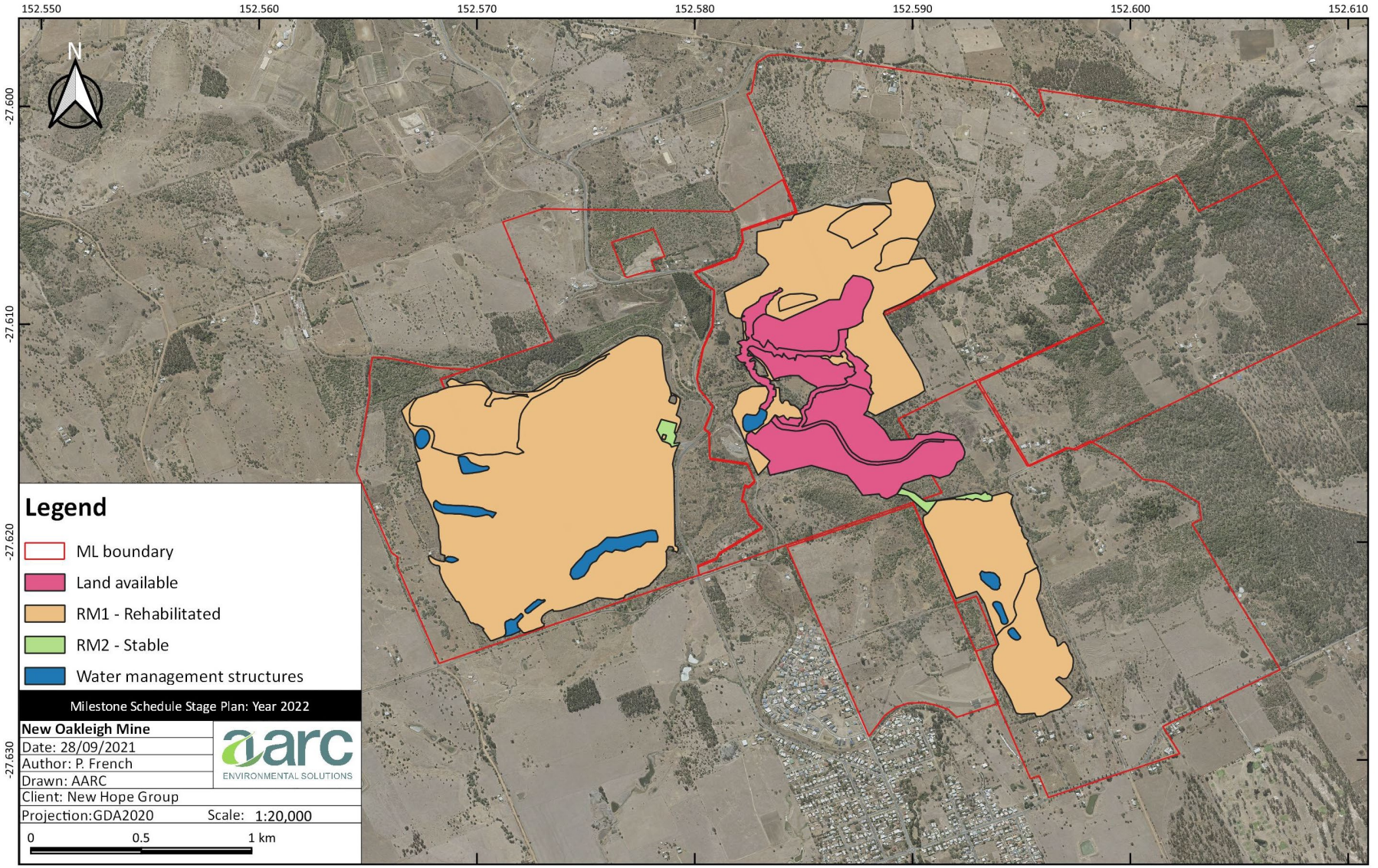

Figure 1: Milestone schedule stage plan: year 2022

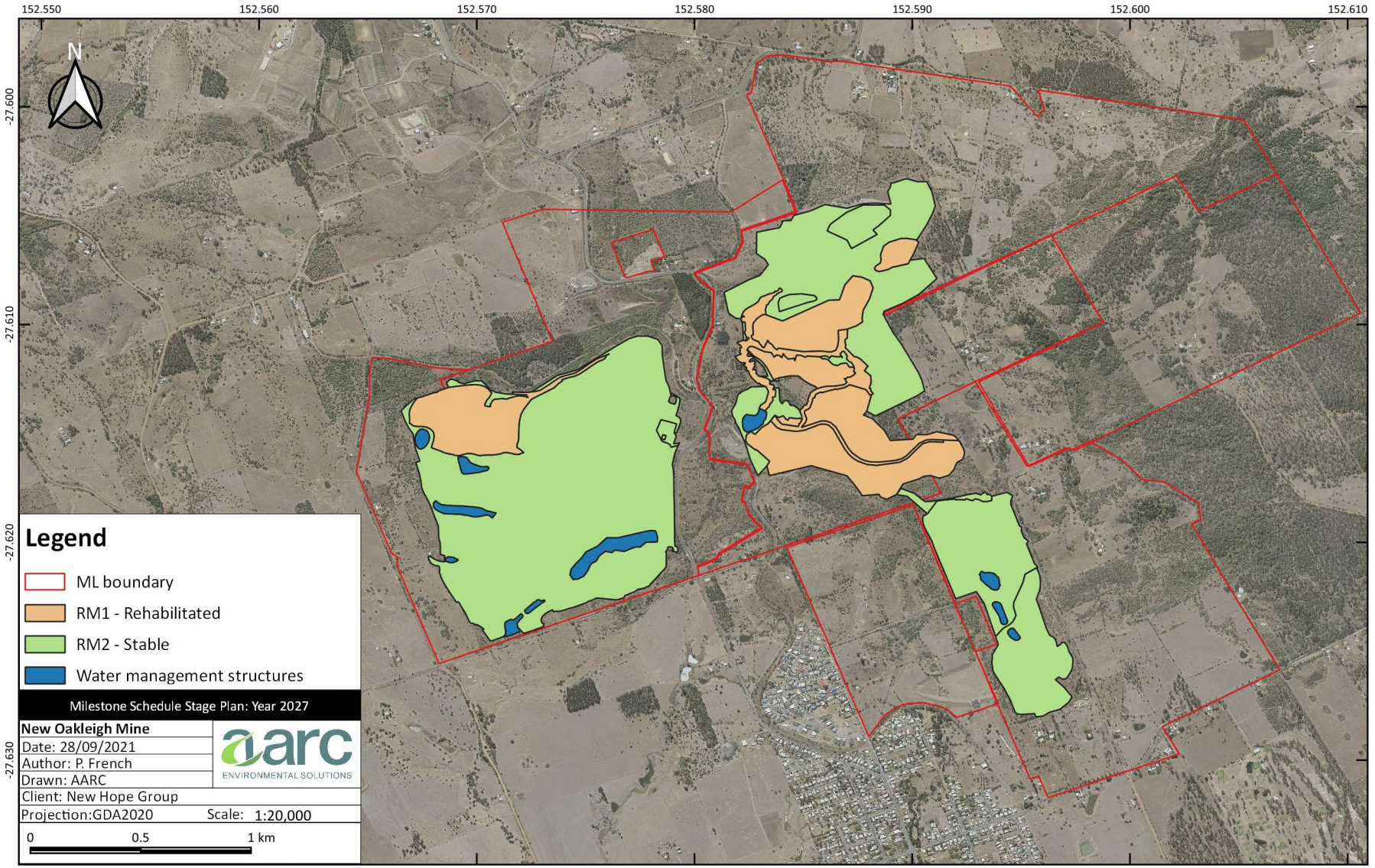

Figure 2: Milestone schedule stage plan: year 2027

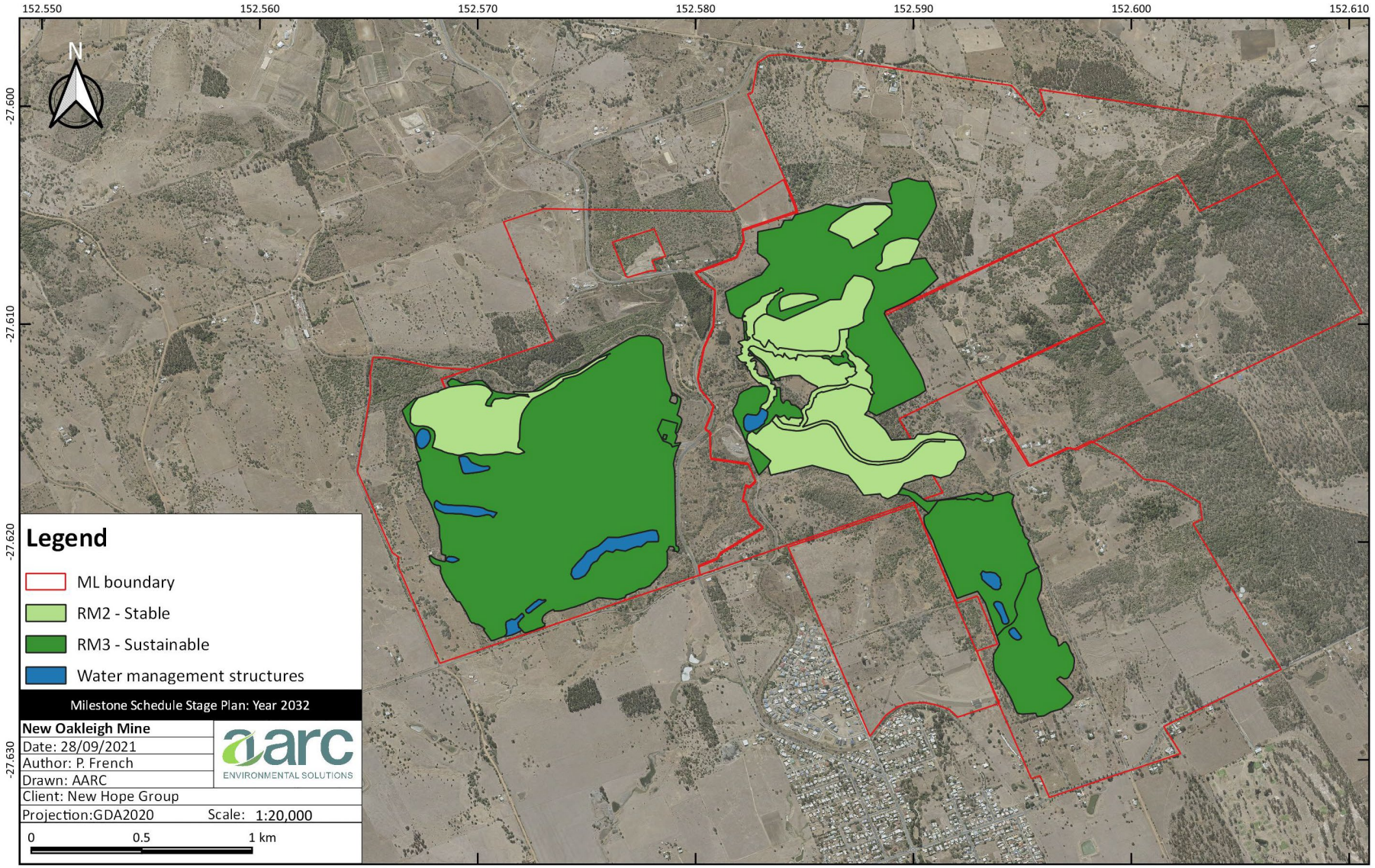

Figure 3: Milestone schedule stage plan: year 2032

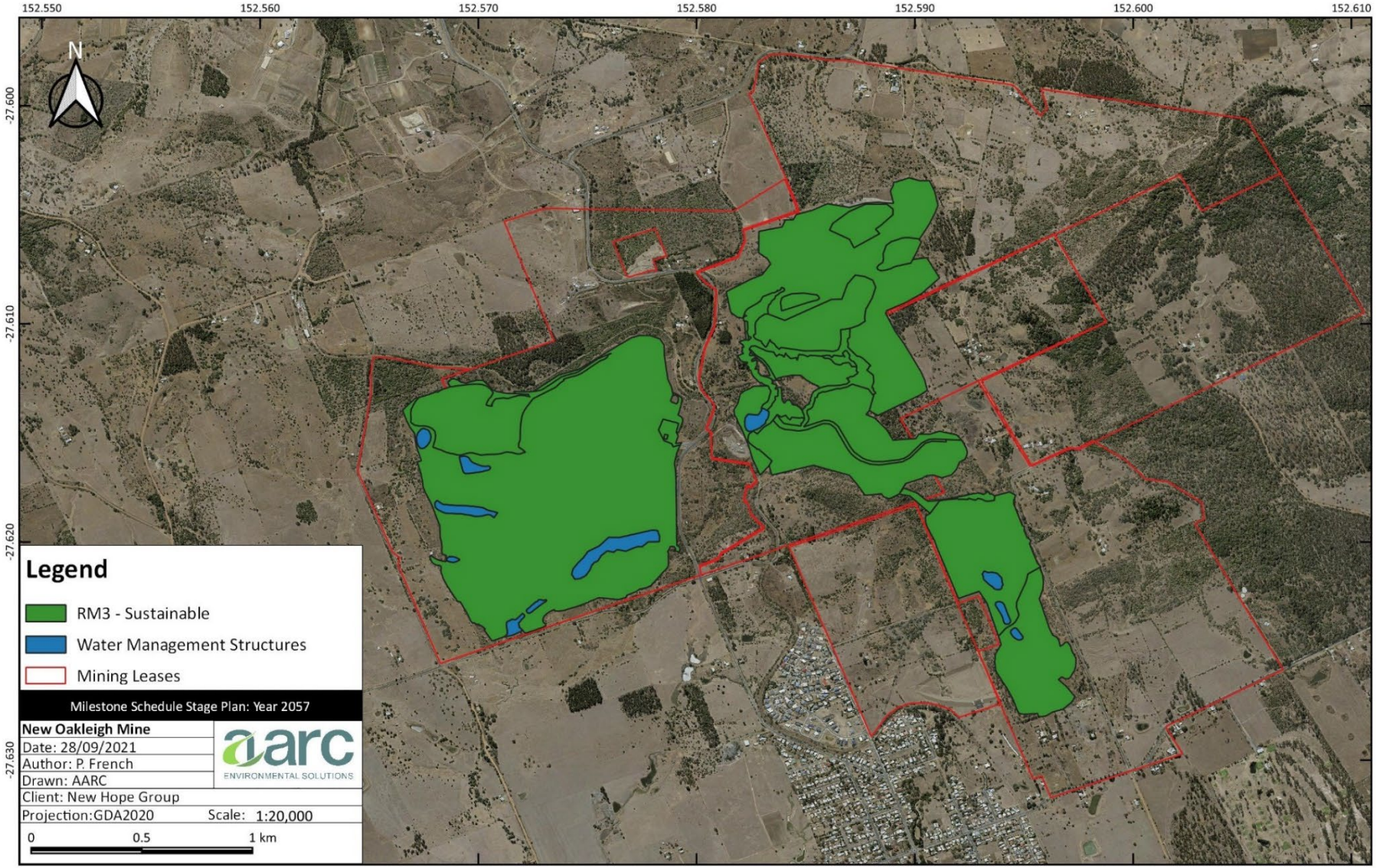

Figure 4: Milestone schedule stage plan: year 2057

D. Rehabilitation Risk Assessment Outcomes

Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating	Management Effectiveness
Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	E	H	M	L		
Waste rock dump(s) (incl. tailings caps, highwalls)																				
Safe																				
Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to subsoil/ topsoil characteristics/availability(?), inadequate surface preparation, poor early germination, localised settlement, rock used for erosion control	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), monitoring, maintenance controls (pre-closure), reduction of rock in current and planned (North) rehab			P		Mi				M			0	0	1	0	M	
Slope steepness in excess of that expected for the PMLU	Inappropriate landform design, landform design restrictions	Safety hazard for personnel, stock and wildlife	Landform design appropriate to PMLU and compliant with EA requirements, operational slope controls			U		Mi				M			0	0	1	0	M	
Stable - geotechnical risk																				
Significant slope failure	Excessive slope steepness, physical material properties, poor drainage, adverse rainfall event	Localised land impacts and downstream water quality impacts	Waste rock dumps generally contained within excavated pits, geotechnical analysis undertaken where appropriate, slope moderation, provision of adequate drainage infrastructure, rapid revegetation			U			Mi				M		0	0	1	0	M	
Stable - erosional risk																				
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required, sediment controls during establishment. Note specific additional controls applied to Northern highwall area.			L			Mi				M		0	0	1	0	M	
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, sub-catchment delineation, sufficient water storage structures, engineered flow channels, effective revegetation techniques, rehabilitation monitoring and management as required			P			Mi				M		0	0	1	0	M	
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Existing rehabilitation of WRDs, downstream sedimentation controls, revegetation, monitoring and maintenance			L			Mi				M		0	0	1	0	M	
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events, other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required			R			Mo				L		0	0	0	1	L	
Non-polluting - geochemical risk																				
Acid and saline drainage generation	Adverse waste rock geochemistry, external to site (natural seep, legacy u/g coal mining impacts)	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts	NAPP waste rock materials, low propensity for saline drainage generation, water quality monitoring and assessment			U			Mo				M		0	0	1	0	M	
Acid and saline drainage generation - impacts to groundwater	Adverse waste rock geochemistry, external to site (natural seep, legacy u/g coal mining impacts)	Groundwater impacts (incl. GDEs)	NAPP waste rock materials, low propensity for saline drainage generation, water quality monitoring and assessment			U			Mi				M		0	0	1	0	M	

Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating	Management Effectiveness
Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	E	H	M	L		
Sustainable - PMLU																				
Insufficient pasture productivity	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/diversity metrics, and shortage of topsoil resources, weed invasion	Insufficient pasture productivity	Ongoing grazing management, soil amelioration, pasture performance monitoring			U			Mi				M		0	0	1	0	M	
Insufficient density/diversity of vegetation in native PMLU	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/diversity metrics, shortage of topsoil resources, weed invasion	Insufficient habitat suitable for native fauna	Species mix, soil amelioration, analogue data			P			Mo				**H**		0	1	0	0	**H**	
Capped tailings disposal areas																				
Safe																				
Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Materials used for capping, capping methodology	Safety hazard for personnel, stock and wildlife	Geotech testing, increased depth of capping material, surface preparation measures			P		Mi				M			0	0	1	0	M	
Stable - geotechnical risk																				
Differential settlement	Materials used for capping, capping methodology	Localised land impacts and downstream water quality impacts	Extended non-operational drying period, geotech testing, increased depth of capping material, no observed differential settlement			P			Mi				M		0	0	1	0	M	
Significant structural failure	Retaining structure failure, physical material properties, poor drainage, adverse rainfall event	Localised land impacts and downstream water quality impacts	Tailings contained in in-situ excavation (ex-pit), provision of adequate drainage infrastructure, rapid revegetation			U			Mo				M		0	0	1	0	M	
Stable - erosional risk																				
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils, adverse weather events	Localised land impacts, exposed tailings	Adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required			U			Mi				M		0	0	1	0	M	
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate retaining structure drainage capacity and/or design, adverse weather events	Localised land impacts, exposed tailings	Tailings contained in in-situ excavation (ex-pit), surface drainage away from capped tailings area, adequate revegetation			U			Mi				M		0	0	1	0	M	
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Tailings contained in in-situ excavation (ex-pit), surface drainage away from capped tailings area, adequate revegetation			U			Mi				M		0	0	1	0	M	
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure / revegetation disease, climatic events	Localised land impacts, exposed tailings and downstream water quality impacts	Adequate / effective revegetation establishment, revegetation monitoring and management as required			U			Mo				M		0	0	1	0	M	
Non-polluting - geochemical risk																				
Acid and saline drainage generation - impacts to groundwater	Adverse tailings geochemistry	Groundwater impacts (incl. GDEs)	Water quality monitoring and assessment			U			Mo				M		0	0	1	0	M	

Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating	Management Effectiveness
Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	E	H	M	L		
Sustainable - PMLU																				
Insufficient density/diversity of vegetation for grazing PMLU	Weather, poor soil characteristics and slopes impacting germination, vegetation establishment and PMLU density/diversity metrics, weed infestations	Insufficient pasture productivity	Ongoing grazing management, soil amelioration, pasture performance monitoring			U			Mi				M		0	0	1	0	M	
Water management structures																				
Safe																				
Dam failure of retained structures	Extreme rainfall events	Downstream hazard to public	Only minor stock dams or engineered water storages to be retained at closure			U		Mi				M			0	0	1	0	M	
Stable - geotechnical risk																				
Wall failure/dam break of retained structures	Extreme rainfall events	Downstream hazard to public	Only minor stock dams or engineered water storages to be retained at closure			U		Mi				M			0	0	1	0	M	
Non-polluting - geochemical risk																				
Water quality in retained storages not meeting PMLU water quality requirements	Adverse geochemical characteristics of disturbed materials in catchment	Livestock health, wildlife hazard	No evidence of adverse water quality in existing comparable structures			U			Mo				M		0	0	1	0	M	
Mine built infrastructure																				
Safe																				
Surface roughness (rockiness, depressions) in excess of that expected for PMLU	Inadequate surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Slopes will be low, surface preparation measures (initial), monitoring, maintenance controls (pre-closure)			P		Mi				M			0	0	1	0	M	
Stable - erosional risk																				
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required, sediment controls during establishment			U			Mi				M		0	0	1	0		
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, sub-catchment delineation, sufficient water storage structures, engineered flow channels, adequate and effective revegetation techniques, rehabilitation monitoring and management as required			U			Mi				M		0	0	1	0		
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Downstream sedimentation controls, revegetation, monitoring and maintenance			U			Mi				M		0	0	1	0		
Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure / vegetation disease / loss, climatic events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt and effective revegetation establishment, revegetation monitoring and management as required			U			Mo				M		0	0	1	0		

Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating	Management Effectiveness
Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	E	H	M	L		
Non-polluting - other environmental harm																				
Contaminated land	Operational phase industrial use of land	Land, surface water impacts	Infrastructure management, housekeeping. Phase 1 assessment at closure, contingent provision for clean-up, water quality monitoring			U			Mo				M		0	0	1	0	M	
Sustainable - PMLU																				
Insufficient pasture productivity or density / diversity of vegetation in native PMLU	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/diversity metrics	Insufficient pasture productivity, habitat unsuitable for native fauna	Ongoing grazing management, soil amelioration, pasture performance monitoring			U			Mi				M		0	0	1	0	M	
Sustainable - NUMA																				
Not applicable															0	0	0	0		
Legacy underground mining																				
Safe/Stable - geotechnical risk																				
Subsidence arising from shaft, tunnel collapse	Legacy mining operations underlying the MLs and occurring from the early 1900s to 1997	Land subsidence and sinkholes	Legacy mining oeprations in the vicinty of the MLs have been mapped and all known shafts/tunnels within the ML identified and/or sealed.			U		Mi				M			0	0	1	0	M	
Non-polluting																				
Interaction of groundwater with legacy underground mining disturbance	Legacy mining operations underlying the MLs and occurring from the early 1900s to 1997	Groundwater resource/quality impacts	site inspections, neighbouring community information			P			Mi				M		0	0	1	0	M	
End of record																				

E. Stakeholder Engagement Plan

New Hope Group

New Oakleigh Coal Mine Closure Project

Stakeholder Engagement Plan

Document Status

Rev No.	Author	Reviewer		Revisions
		Name	Date	
0	MW	MC	22.11.11	
1	MW	MW	21.12.11	
2	AS	AS	27.09.21	Review and update for current NO status

Table of Contents

List of Figures

List of Tables

1.0 Introduction

1.1 Background

The New Oakleigh Mine is owned by New Oakleigh Coal Pty Ltd, a subsidiary of the New Hope Group (NHG). The mine is located approximately 2km north of the town of Rosewood (Figure 1-1), within the Ipswich City Council local government area of Queensland. Mining has occurred in the Rosewood area since the early 1900's however the current economy of Rosewood does not rely solely on mining. Commercial and agricultural industries are important industries for the Rosewood community.

At New Oakleigh, mining was initially undertaken by underground methods with open cut operations commencing in the 1970's. Underground mining ceased in the late 1990's prior to the purchase of the mine by NHG in 1999. Surface mining operations commenced in 2000 and ceased in February 2013. Progressive rehabilitation activities have been underway since prior to 1997 and are ongoing.

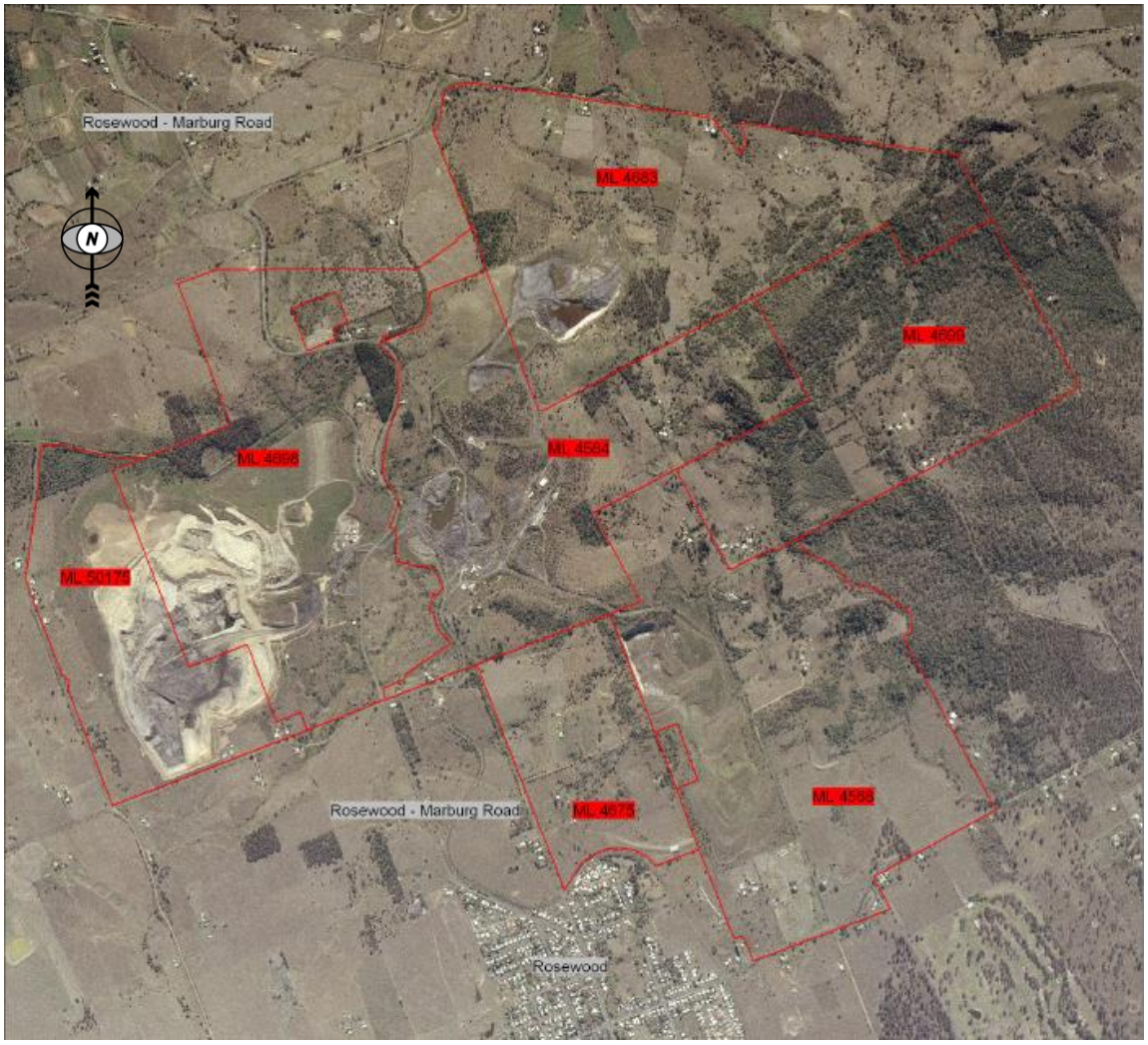

Figure 1-1 New Oakleigh Coal Mine Leases

1.2 Mine Closure

The New Oakleigh Mine Closure Project (the Project) seeks to close and rehabilitate all land disturbed by mining within the New Oakleigh Coal Mine.

The Project aims to:

- reduce or eliminate adverse environmental effects once the mine ceases operations;
- establish physical and biological conditions which meet regulatory requirements;
- ensure the closed mine does not pose an unacceptable risk to public health and safety; and
- enable the surrender of the New Oakleigh Coal Environmental Authority and relinquishment of all Mine Leases.

2.0 The Stakeholder Engagement Planning Process

This Stakeholder Engagement Plan has been prepared to:

- Identify and classify all stakeholders who will be influenced by the Project; and
- Develop an engagement program that ensures the Project implementation meets stakeholder and community expectations.

This Plan establishes a clear outline of activities to manage relevant community and stakeholder concerns. The process via which the Plan has been developed is outlined in Figure 2-1.

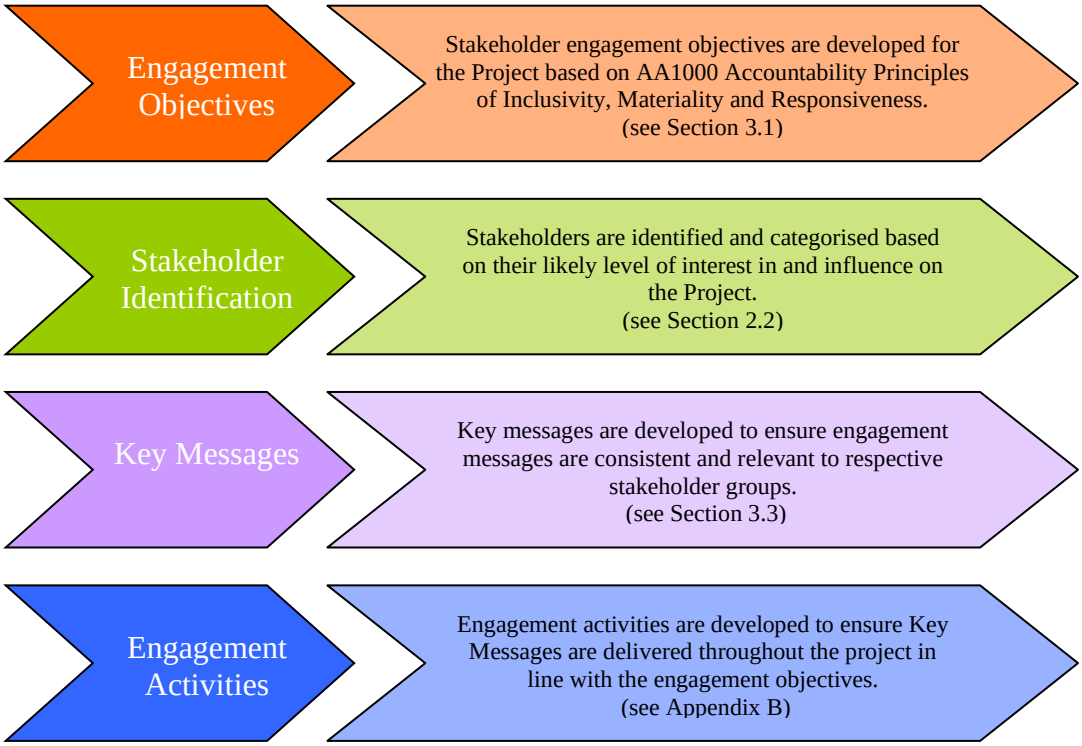

Figure 2-1 The Stakeholder Engagement Process

2.1 Stakeholder engagement objectives

Mine closures have the potential to generate a level of sensitivity for a large range of stakeholders and the surrounding community. New Oakleigh Coal will engage with the community and stakeholders related to the Project and meet the engagement objectives listed in Table 2-1.

Table 2-1 Stakeholder Engagement Objectives

Objective	Description
Operate an open and transparent engagement process.	The stakeholder engagement methodology will adopt an open and transparent approach to informing stakeholders of the objectives and activities for the Project.
Be responsive to stakeholders.	Stakeholder ideas, issues and opportunities will be identified and documented through established communication channels and face–to–face consultation. All contact will be managed via the Stakeholder Contact Database (refer to separate document). This will involve an open, two–way process. New Oakleigh Coal will acknowledge receipt of stakeholder feedback and 'close the loop' with stakeholders at the end of a consultation period by informing them as to how their input has been considered.
Disseminate information in a timely manner.	Information will be disseminated taking into account the time stakeholders will need to understand it and respond appropriately. Information dissemination will be timely in order to manage any misinformation or rumours that may arise.
Remain accountable to stakeholders.	New Oakleigh Coal will demonstrate integrity and be accountable to stakeholders during the engagement process and commitments will be made in good faith. Accountability will occur through the reporting of outcomes, periodic evaluation of the engagement process and the achievement of objectives.

3.0 Stakeholder Analysis

3.1 Stakeholder identification

The stakeholder list will be continually reviewed throughout the duration of the project to ensure all stakeholders are identified and their issues are understood and addressed.

3.2 Stakeholder classification

Stakeholders for the Project have been classified into four levels to allow for:

- Addressing needs and issues for stakeholders efficiently;
- Directing appropriate resources at engagement activities for each level of stakeholder; and
- Identifying important stakeholders who require strategic management.

3.2.1 Level 1 Stakeholders

Level 1 stakeholders are strategically important to the success of the Project. Strategic engagement will be limited to these stakeholders. Table 3-1 lists the Level 1 Stakeholders for the Project.

Table 3-1 Level 1 Stakeholders

Level 1 Stakeholder	Description
New Hope Coal Board of Directors	The Board are key stakeholders who provide strategic direction for the Project.
New Hope Corporation Senior Management	The Senior Management are key stakeholders who implement strategic direction for the Project.
Department of Environment & Science (DES)	DES is the administering agency for the site Environmental Authority and has ultimate responsibility for the sign off of satisfactory rehabilitation and closure without which leases can not be relinquished.
Employees	Employees may have an interest in the Project with respect to human resource management and the progress of the Project.

3.2.2 Level 2 Stakeholders

Level 2 stakeholders are likely to have a high level of influence and a high level of interest in, and/or concern about, the Project. Level 2 stakeholders can be people who other audiences trust and are influenced by. They can provide gateways to community opinions and reactions.

Table 3-2 lists the Level 2 stakeholders for the Project

Table 3-2 Level 2 Stakeholders

Level 2 Stakeholder	Description
Australian Railway Historical Society	A historic rail easement is located within the New Oakleigh site.
Ipswich City Council Works Department	A Council landfill and transfer station exists within/adjacent the New Oakleigh site.
Surrounding Landowners	Landholders who neighbour the New Oakleigh Mine and have an interest in aspects of relinquishment.
Resources Safety and Health Queensland	Chief Inspector of Coal Mines – responsible for administering safety and health legislation applying to Queensland's resources industries.
Queensland Department of Resources	Responsible for mining tenure administration.
Ipswich City Council - Mayor	Local Government has a strong interest in the environmental and social aspects of the Project. Currently Teresa Harding
Ipswich City Council – Division 4 Local Councillors	Currently Kate Kunzelmann and Russell Milligan.

3.2.3 Level 3 Stakeholders

Level 3 stakeholders may have an interest in the Project, or have a high level of interest in the Project but a limited level of influence. Table 3-3 lists the Level 3 stakeholders for the Project.

Table 3-3 Level 3 Stakeholders

Level 3 Stakeholder	Brief Description
Rosewood District Protection Organisation (RDPO)	The RDPO represent a portion of the Rosewood community and have a strong interest in the mining activities of the region.
Energex	Infrastructure providers interested in timing and economic impact of the Project and relevance to other NHG sites.
Urban Utilities	Infrastructure providers interested in timing and economic impact of the Project and relevance to other NHG sites.
Non-Governmental-Organisations (NGO's) - Relevant advocacy groups that have an interest in NHG projects in the region.	NGO's who have a close relationship with New Oakleigh Coal and may provide input on consultative groups.
Issue Based Stakeholders	Stakeholders with specific interest in the Project.

3.2.4 Level 4 Stakeholders

Level 4 stakeholders may have no interest in the Project, or have a low level of influence and a low level of interest in the Project. Table 3-4 lists the Level 4 stakeholders for the Project.

Table 3-4 Level 4 Stakeholders

Level 4 Stakeholder	Brief Description
Contracting Employees & Family	Contracted employees and family may have an interest in the Project with respect to jobs and the progress of the Project.
New Hope Coal Shareholders	Shareholders may have an interest in the Project with respect to its potential impact on the value of their investment.
Indigenous Cultural heritage groups	Traditional owners may have an interest in culturally significant sites near the Project site.
European Cultural heritage groups	Community members may have an interest in European Culture sites within and near the Project site.
Local Residents	Community located near the Project site.
West Moreton Landcare	West Moreton Landcare may have an interest in how the land will be rehabilitated.
Community Groups	All community groups who may be interested or impacted by the Project.
Local Charity Groups	All local charity groups who may be interested or impacted by the Project.
Religious Organisations	All religious organisations who may be interested or impacted by the Project.
Education Services	All education providers who may be interested or impacted by the Project.
Federal Member for Ryan	Elected representatives may have an interest in the environmental and social aspects of the Project.
State Member for Area	Elected representatives may have an interest in the environmental and social aspects of the Project.
Emergency Services	All emergency services providers interested or impacted by the Project.
Healthcare	All healthcare providers interested or impacted by the Project.
Industry Associations	Industry bodies may use the Project as a case study for mine closure planning within the industry.

Level 4 Stakeholder	Brief Description
Ipswich Chamber of Commerce	The Chamber may have an interest in how the Project will influence their member base.
State Government	Agencies interested in impact on Government services in the region as a result of the Project. Approval agencies on the rehabilitation of the site and relinquishment of the lease.
Unions	Unions with a strong history with New Oakleigh Coal and interested in workforce and social impact of the Project.
Customers	NHG customers interested in impact of the Project on NHG production capabilities.
Suppliers & Contracting Companies	Major contractors interested in timing and economic impact of the Project and relevance to other NHG sites. New Oakleigh Coal suppliers interested in the timing and economic impact of the Project and relevance to other NHG sites.
Media	Media agencies with an interest in NHG as an organisation and of the processes surrounding the first full mine closure in the region.
Local Businesses	Local businesses who may have an interest in the Project.
Other Mines	Competitors who will use the Project as a case study for mine closure planning within their organisation.

4.0 Stakeholder engagement

4.1 Managing Stakeholder Concerns

Stakeholder concerns will be monitored and managed to ensure appropriate reporting and resolution via the process outlined in Figure 4-1.

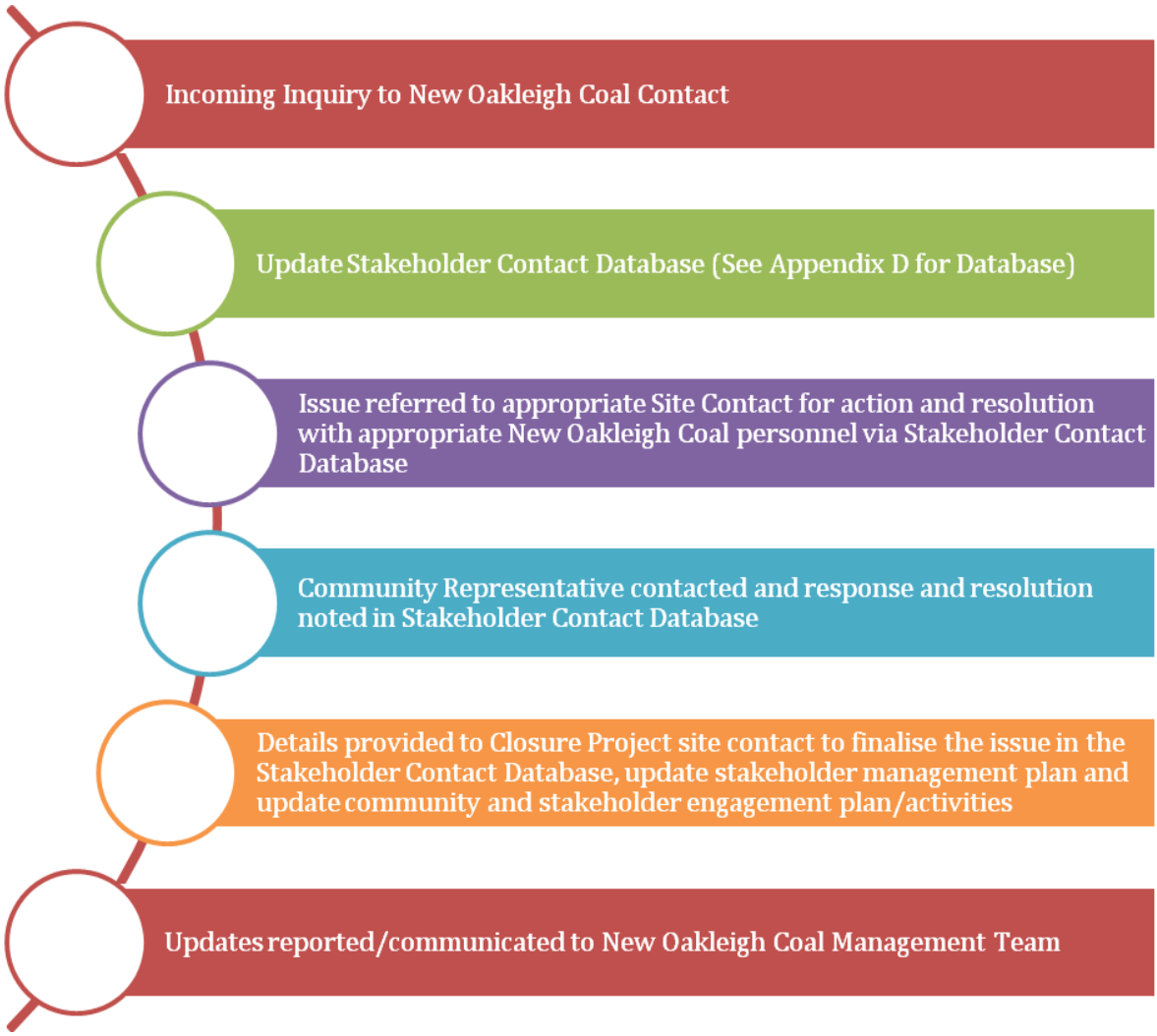

Figure 4-1 Issues Management Process

4.2 Engagement activities

New Oakleigh Coal will develop structured and effective engagement activities tailored to specific stakeholders.

Activities have been identified for three separate phases of the engagement process. Table 4-1 lists the Objectives and Activities for each of these phases and Table 4-2 provides a responsibility matrix for the activities and timelines for their implementation.

Table 4-1 Stakeholder engagement Phases, Objectives and Activities

Phase	Purpose	Objectives	Engagement activities
1 – Prepare and plan (completed)	Phase 1 involves providing information to employees about the closure and why it is necessary. It will aim to provide transparent information as well as a level of comfort regarding timeframes and ongoing projects. This process will include communications to address stakeholder issues and concerns, maintain morale and security amongst employees.	▪ Providing a level of staff and contractor security to support retention and recruitment ▪ Decrease any negative impact on employee productivity through controlling rumours about the future of the mine ▪ Providing a level of security for external stakeholders including landholders, local residents and businesses, suppliers and customers, ▪ Aligning with company messages and future opportunities within NHG.	**Internal** ▪ Stakeholder Engagement and Communication Plan ▪ Stakeholder Contact Database ▪ Media Plan ▪ Employee Engagement Plan
2 – Initial engagement (completed)	Phase 2 will focus on consultation with key stakeholders and providing opportunities for input on the Project. Planning requires detailed information from stakeholders about future choices when Project is completed. Stakeholders will be asked to detail their issues relevant to the closure of the site.	▪ Providing a level of staff and contractor security to support retention and recruitment ▪ Controlling rumours about the future of the mine ▪ Providing a level of security for external stakeholders including landholders, local residents and businesses, suppliers and customers, ▪ Aligning with growth messages and future opportunities within NHG, without promises or raising expectations unless they can be given, ▪ Gathering community and stakeholder input and information to inform closure planning	**Internal** ▪ Provide management briefings ▪ Implement Employee Engagement Plan ▪ Communication material as required **External** ▪ Meet with relevant DES representatives ▪ Maintain Stakeholder Contact Database ▪ Implement Media Plan ▪ Communication material as required

Phase	Purpose	Objectives	Engagement activities
		studies.	
3 – Inform and consult (ongoing)	Phase 3 will engage with stakeholders on the results of the Project informing and requesting feedback on community impacts and the process moving forward.	▪ Focusing on the positive elements of the outcome ▪ Providing a level of staff and contractor security to support retention ▪ Controlling rumours about the future of the mine ▪ Providing a level of security for external stakeholders including landholders, local residents and businesses, suppliers and customers. ▪ Developing mechanisms for mitigating impacts associated with closure. ▪ Responding to requests for information on closure and rehabilitation outcomes. ▪ Maintaining an ongoing dialogue with neighbours as required.	**Internal** ▪ Provide management briefings ▪ Implement Employee Engagement Plan ▪ Communication material as required **External** ▪ Stakeholder Contact Database ▪ Implement Media Plan ▪ Update website ▪ Face to face stakeholder meetings ▪ Communication material as required

Table 4-2 Responsibility matrix

Phase	Activity	Responsible person/department	Timing
Phase 1 - Prepare and Plan	Conduct project scope/risk and issues workshop	Snr Environmental Project Officer	November 2011
Phase 1 - Prepare and Plan	Finalise Stakeholder Engagement Plan	Snr Environmental Project Officer	January 2012
Phase 1 - Prepare and Plan	Prepare Employee Engagement Plan	HR Department	January 2012
Phase 1 - Prepare and Plan	Prepare Media Plan	Manager - Corporate Relations	January 2012
Phase 2 - Initial Engagement	Undertake management briefing	Snr Environmental Project Officer GM – West Moreton	February 2012
Phase 2 - Initial Engagement	Implement Employee Engagement Plan	HR Department	February 2012
Phase 2 - Initial Engagement	Implement Media Plan	Manager - Corporate Relations	February 2012
Phase 2 - Initial Engagement	Develop communications material as required	Manager - Corporate Relations	Ongoing for life of Mine Closure Project
Phase 2 - Initial Engagement	Initial meeting with DES	Snr Environmental Project Officer	February 2012
Phase 3 - Inform and Consult	Implement Employee Engagement Plan	HR Department	Ongoing for life of Mine Closure Project
Phase 3 - Inform and Consult	Implement Media Plan	Manager - Corporate Relations	Ongoing for life of Mine Closure Project
Phase 3 - Inform and Consult	Conduct face to face stakeholder meetings as required	Snr Environmental Project Officer	Ongoing for life of Mine Closure Project
Phase 3 - Inform and Consult	Update company website	Manager - Corporate Relations	Ongoing for life of Mine Closure Project
Phase 3 - Inform and Consult	Develop communications material as required	Manager - Corporate Relations	Ongoing for life of Mine Closure Project
Phase 3 - Inform and Consult	Undertake management briefing	Snr Environmental Project Officer	Ongoing for life of Mine Closure Project
Phase 3 - Inform and Consult	Maintain Stakeholder Contact Database	Snr Environmental Project Officer	Ongoing for life of Mine Closure Project

F. Community Consultation Register

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
16/02/2011	New Hope (2) DERM ICC – Cr David Pahlke Community Bank West Moreton Landcare RDPO (4)	CCAP meeting	Operational and planning update Flooding in West Pit Bremer River water quality monitoring results	Concern that final level of area remains below level of train line	New Hope aware of concerns and taking them into consideration in design of final landform
				Trees planted should not block view from rail line	New Hope aware but options limited due to imperative to gain best environmental outcome
				Weed trees along Rosewood-Marburg Rd	Local weed contractor engaged
				Plans for area north of Ipswich Rosewood Rd at Jeebropilly	Riparian project planned to re-establish vegetation along Bremer River immediately north of 7-mile Bridge
				Height of Washplant Pit Dump	Efforts being made to avoid raising it higher, but dependent on available dumping space
				Removal of Key Resource Area	No negative effect on current operations, but New Hope would prefer it was removed. New Hope representative happy to attend any meetings to determine the process for removing the KRA
22/06/2011	New Hope (3) DERM Ipswich & Lockyer Greens Local residents (4) RDPO (5)	CCAP meeting	Operational and planning update Introduction of new Senior Environmental Officer	What is the plant species mix	Provided
19/10/2011	New Hope (3) ICC – Cr David Pahlke Local resident RDPO/Ipswich & Lockyer Greens RDPO (6)	CCAP meeting	Operational update Rehabilitation planning: Groundwater Study and Contaminated land Assessment are underway	Will dump height on western side be reduced	Yes, dumping is currently being carried out to facilitate backfilling the final void at the end of mining

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
15/02/2012	New Hope (3) DERM (2) ICC – Cr David Pahlke RDPO (6) Local resident Ebenezer Against Mining West Moreton Landcare Cabanda & Community Bank RDPO/QLD Greens	CCAP meeting	Operational update Penalty Infringement Notice from DERM re surface water discharge in July 2011	Concern that rehabilitation will not occur in a timely manner and whether groundwater will be considered	No specific timeline for rehabilitation activities; closure studies (including groundwater) to be considered in developing Closure Plan
19/07/2012	New Hope (2) ICC – Cr David Pahlke West Moreton Landcare RDPO (3) Local resident	CCAP meeting	Operational update: Trucks will be carting coal from Oakleigh to Jeebropilly for a few months after mining has ceased, rehabilitation activities will continue thereafter	Lack of rehabilitation planning updates in previous 5 months	Direct consultation with stakeholder groups planned in coming months; progress updates scheduled for coming meetings
				Request that the mine profile be similar to that of pre-mining, below railway height and that there be no residual void	Void will be made safe and stable. Stakeholder consultation will be taken into consideration in rehabilitation planning
17/10/2012	New Hope (3) ICC – Cr David Pahlke West Moreton Landcare RDPO (5) Local resident	CCAP meeting	Operational update: Trucks will be carting coal from Oakleigh to Jeebropilly for a few months after mining has ceased, rehabilitation activities will continue thereafter	Lack of rehabilitation planning updates in previous 5 months	Direct consultation with stakeholder groups planned in coming months; progress updates scheduled for coming meetings
				Request that the mine profile be similar to that of pre-mining, below railway height and that there be no residual void	Void will be made safe and stable. Stakeholder consultation will be taken into consideration in rehabilitation planning
18/02/2013	New Hope (4) DEHP (2) Beaumont Bulk Haulage	CCAP meeting	Rehabilitation update: approximately 1.5 Mm^3 of spoil returned to void since mid-August 2012; remaining coal stockpiles expected to be depleted by	Concern over course backfill near Rosewood	It will break down; rehabilitation needs to work to a process
				Questions over what will happen with excess fill and topsoil	No excess fill expected and there was enough topsoil

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
	RDPO (4) Ebenezer Against Mining Local residents (4)		end of March; approximately 12-18 months of work required to complete backfill and re-shape the site	Question about a Government publication regarding restoration and rehabilitation	The final state of the land would depend heavily on the area's zoning and that a balance was required between what was in place previously and what the council is aiming to have in the future
22/05/2013	New Hope (2) Local resident RDPO (7)	CCAP meeting	Rehabilitation update: approximately 500 km^3 of material returned to void; approximately 12-15 months of work required to complete backfill and re-shape the site	Query about whether it was still the company's intention that there be a consultative approach to the final landform design	Confirmed that this was the case
28/08/2013	-	CCAP meeting	Rehabilitation update: 800 km^3 of material returned to void since May 2013	—	—
02/10/2013	New Hope (4) West Moreton Landcare ICC – Cr David Pahlke Local resident RDPO (5)	CCAP meeting	Rehabilitation update: 800 km^3 of material returned to void since May 2013	Enquiry as to whether all the available spoil would be used up	By the end of the rehabilitation work close to no spoil would remain, and the landform would be close to the previous form.
19/02/14	New Hope (2) DEHP ICC – David Pahlke West Moreton Landcare	CCAP meeting	Project update: total of approximately 3.5 Mm^3 of material returned to void, approximately 0.5 Mm^3 still to be returned; bulk earthworks to be complete by end of 2014, additional	Support (from Paul Kennedy) for using Normanton Dump to back fill the current void. Any lowering of the dump height might reinstate the view of a number of residents along Blake's Rd	—

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
	Local residents (2) RDPO (8)		work thereafter mainly on drainage; site has been split into three planning areas based on distinct catchments/areas of disturbance. Each area has specific issues to be addressed and planning will happen in a staged sequence – Western Area then the Normanton Area then the Eastern Area. Agreement to change the frequency of meetings from quarterly to three meetings per years	Concern over anecdotal evidence that electrical transformers had been left underground in some workings	New Hope aware of issue (identified in contaminated land assessment). No information on exact location, monitoring for potential contamination continues
25/06/14	New Hope (3) ICC – Cr David Pahlke West Moreton Landcare RDPO (7) Local residents (4)	CCAP meeting	Project update: total of approximately 3.5 Mm^3 of material returned to void, approximately 0.5 Mm^3 of still be returned; total volume required to backfill void adjusted from 4M cubic meters to 4.5M cubic meters due to minor change in design; 1,000 cubic meters of purchased topsoil stockpiled for when land becomes available	What grass species are being used in rehabilitation; what trees will be planted	Seed mix provided; required to re-establish 30ha of native ecosystem, looking at an area of Brigalow regrowth east of Rosewood-Marburg Rd
				Potential for biological control of Cats Claw Creeper that is being run by SEQ catchments	Will look into possibility of utilising the program as part of weed control work. UPDATE: no active weed management being undertaken at Oakleigh East until rehab concept has been decided as it may end up being cleared as part of rehabilitation works
15/10/2014	New Hope (4) ICC – Cr David Pahlke West Moreton Landcare Local resident RDPO (8)	CCAP meeting	Project update Rehabilitation planning: overview of conceptual rehab plan presented and discussed. Plans are concept level, nothing has been decided	Query about timing for topsoiling	Stockpiled topsoil will be spread this week, seeding is intended soon after
18/02/2015	New Hope (2) West Moreton Landcare ICC – Cr David Pahlke	CCAP meeting	Rehabilitation update: additional 6 ha topsoiled and seeded in November; full activity to recommence in March; main earthworks at Oakleigh West to be	Query about the success of November seeding	Strike rate good although it looks yellowish. Siratro/Glycene coming through, potentially from seeds in topsoil

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
	RDPO (9)		completed by August 2015; demolition of tunnels at Oakleigh East to commence in March/April	Query about erosion at North Pit	Conceptual plan includes work to stabilise the area; sediment does not leave the site; not worth undertaking repairs until final rehabilitation plan has been settled
24/06/2015	New Hope (2) ICC – Cr David Pahlke West Moreton Landcare RDPO (5) Local residents (3)	CCAP meeting	Project update: full activity recommenced in March 2015; bulk earthworks to be completed July 2015; Oakleigh East Building demolition and tunnel rehabilitation to commence shortly; Conceptual Rehabilitation Plan is being reviewed	Concerns over use of biosolids regarding smell and build up of contaminants/medical compounds	Not using worst smelling grade, spreading to stop if wind direction is towards a nearby sensitive receptor, biosolids must be incorporated into the ground within 24 hours as a measure to control odour. No chance of accumulation at the rates being applied
				Concern over anecdotal evidence that electrical transformers had been left underground in some workings	New Hope aware of issue (identified in contaminated land assessment). No information on exact location, monitoring for potential contamination continues
14/10/2015	-	Information letter	Biosolids being used in rehabilitation works	—	—
21/10/2015	New Hope (2) ICC – Cr David Pahlke West Moreton Landcare RDPO (3) Local residents (3)	CCAP meeting	Project update: bulk earthworks at Oakleigh West complete; drainage lines established; biosolids to be used at Oakleigh West starting in the following week for 4-5 weeks; Conceptual Rehabilitation Plan for Oakleigh East is being reviewed; workshop hosted at New Oakleigh focused on rehabilitation techniques	Rehabilitation of tunnels and potential for subsidence	New Hope engages Moreton Geotechnical Services (used by ICC) who provide independent expert advice on how to rehabilitate tunnels and shafts. Each tunnel is inspected and an individual plan for rehabilitation is developed.
				Query about what is being done with the bund to the west of Rosewood-Marburg Rd	It will be removed.
				Face of Oakleigh North Pit	The face will be rehabilitated to be made stable, then revegetated.

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
				Are there going to be any "Rosewood Scrub" species re-established at New Oakleigh	New Hope is required to re-establish 30 ha of native ecosystem. New Hope is looking at supplementary planting of existing areas of regrowth and some "Rosewood Scrub" species will be included. For previous planting New Hope has sought input from local experts, including Martin Bennet and Arnold Rieck on appropriate species to include.
16/03/2016	New Hope (2) RDPO (6) Local resident	CCAP meeting	Project update: Biosolids were not applied due to issue with EHP paperwork	Request for confirmation of intention to use biosolids in rehabilitation	Confirmed intention to use biosolids in rehabilitation, although smaller volume than originally.
				Concern over water seepage along Urry Rd	Confirmed that it is believed to be a natural seep that originates somewhere north of Urry Rd. Salt levels consistent with local groundwater.
				Request that bunds along Rosewood-Marburg Rd and Urry Rd be removed	Most have been removed and the dirt used elsewhere. There is no current plan to remove the remainder.
				Concern over old tyres still on site	The old tyres will be disposed of according to legal requirements
				Concern over diesel spill from several years ago	Any potential contamination will be dealt with before the rehab will be signed off.

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
				What is the plan for rehabilitation at Oakleigh East, with particular reference to the overburden dump at Normanton?	No decisions had made at the time as New Hope still considering options for rehabilitation. One option includes taking the dump down and using it to backfill the void. A number of issues need to be considered in this decision including re-disturbing areas that are well rehabilitated and the impact on near neighbours if we were to go back into that area. UPDATE: the spoil dump has been removed and used to backfill the Normanton void
				Concern over erosion along Blakes Rd. Request to use wattles interplanted with other species to help stabilise the banks	Confirmation that there is significant erosion in the rehabilitation in that area. Will need to be addressed as part of the final rehabilitation design. Stated that revegetation will be key to minimising erosion and controlling sediment. New Hope is considering all alternatives.
				Request that "Rosewood Scrub" species be planted in the gully lines re-established at Oakleigh West	There are no current plans to plant trees in these areas. New Hope still needs to determine how the Native Ecosystem rehabilitation requirement will be met including the best place to establish these trees.
19/06/2016	RDPO	Email to Brad O'Reilly	—	Lack of consultation, specifically over plant species used in rehabilitation, and request that a suitably qualified expert on local plants and ecosystems be consulted before the next phase of rehabilitation	No response recorded

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
20/07/2016	New Hope (2) ICC – Cr David Pahlke RDPO (6)	CCAP meeting	Project update: Biosolids application completed in May 2016; design work has commenced for final landform design options for Oakleigh East (rehab works to commence after August 2017)	—	—
16/11/2016	New Hope (2) RDPO (4)	CCAP meeting	Project update: Oakleigh West – stabilisation of main channel using soil binder; commenced aerial surveys investigating ongoing usage for erosion monitoring/vegetation density etc. Oakleigh east – site work ongoing to remove existing infrastructure; Design work has commenced for final landform options for Oakleigh East, there are a number of stakeholders/impacted parties who will be consulted – ICC waste transfer facility, Railway etc. Drainage is a key consideration	—	—
24/05/2017	New Hope (2) ICC – Cr David Pahlke RDPO (5) West Moreton Landcare	CCAP meeting	Project update: Oakleigh West: physical rehab works complete, monitoring and maintenance ongoing; remaining infrastructure being tidied up; erosion and sediment control effective following significant flow event; aerial surveys ongoing Oakleigh East: Site work to remove existing infrastructure complete;	Concern over historic diesel spill	It was cleaned up at the time, a contaminated land assessment will be undertaken as part of closure process
				Concern over lack of tree cover for land to be suitable for grazing	To be assessed prior to commencement of grazing, expecting some natural germination of native tree species to occur similar to other sites
				Suggestion that AR/CT be engaged to avoid delays in sourcing native seed/seedlings	Agreed that AR/CT will be consulted when the design work has advanced sufficiently

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
20/09/2017	—	CCAP	Project update: Oakleigh West – workshop cleared out, equipment being progressively relocated from site; ongoing monitoring and management of erosion and sediment controls, vegetation establishment etc. Oakleigh East – removal of infrastructure, buildings etc. complete; sealing of underground shaft complete; detailed design work underway; closure planning continues	—	—
14/03/2018	—	CCAP drop-in session	Project update: rehabilitation progress, North Pit area concept design, drainage concept design; completion of detailed design at Oakleigh East scheduled for mid-late 2018; commencement of capping at North Pit tailings dam scheduled for late 2018; possible removal of remaining infrastructure at Oakleigh East scheduled for late 2018; commencement of bulk earthworks to backfill Normanton Put scheduled for early 2019	—	—
14/03/2018	—	CCAP meeting drop-in session	Project update: sealing of underground works at Oakleigh East complete; removal of infrastructure 95% complete; detailed design of final landform and drainage underway	—	—
04/12/2018	—	CCAP meeting drop-in session	Project update: sealing of underground works at Oakleigh East complete; removal of infrastructure 95% complete; detailed design of final landform and drainage underway; tailings dam capping commenced	—	—

Date	Attendees/representatives	Consultation type	Information topics	Issue raised by community	New Hope response
07/05/2019	—	CCAP meeting drop-in session	Project update: sealing of underground works at Oakleigh East complete; removal of infrastructure 95% complete; detailed design of final landform and drainage underway; tailings dam capping underway; Normanton void backfilling to commence mid-2019 (12-month duration); indicative timing of works	—	—
2020[1]	—	—	—	—	—

1. Meetings/drop-in session have been suspended since 2020 due to the COVID-19 pandemic, with correspondence maintained in the form of a flyer.

G. Monitoring and Maintenance Plan

REHABILITATION MONITORING AND MAINTENANCE PLAN

NEW OAKLEIGH MINE

PREPARED FOR
NEW HOPE GROUP

1 SEPTEMBER 2021

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Table of Contents

List of Figures

List of Tables

Table of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ATCW	ATC Williams Pty Ltd
EA	Environmental Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAF	Queensland Department of Agriculture and Fisheries
DES	Queensland Department of Environment and Science
DM/ha	dry matter/hectare
FPC	Foliage Projective Cover
GIS	Geographic Information System
GPS	Global Positioning System
IECA	International Erosion Control Association
KBR	Kellogg Brown & Root Pty Ltd
NATA	Association of Testing Authorities
PMLU	post-mining land use
PRCP	Progressive Rehabilitation and Closure Plan
QLD	Queensland
RA	Rehabilitation Area
RE	Regional Ecosystem
RM	Rehabilitation Milestone
T1	Canopy tree layer
T2	Subcanopy tree layer
TDS	Total Dissolved Solids

1 Introduction

1.1 Purpose

The purpose of this monitoring and maintenance plan is to inform the development and implementation of rehabilitation monitoring programs at New Oakleigh Mine.

Rehabilitation monitoring is undertaken to provide a scientific basis to support:

- an informed assessment of rehabilitation performance able to support the progressive certification and eventual relinquishment of the mining lease following mine closure;
- the identification of rehabilitated areas not achieving a trajectory towards successful completion and the implementation of remedial action; and
- the continuous review and development of rehabilitation methodologies suited to New Oakleigh Mine.

Effective rehabilitation monitoring plans are designed through consideration of the following steps:

1) the definition of the post-mining land uses (PMLU) to be achieved;
2) the identification of specific 'rehabilitation areas' or 'domains' where different post-mining land uses might be targeted;
3) the nomination of appropriate rehabilitation objectives for each rehabilitation area;
4) the establishment of completion criteria for each rehabilitation area; and
5) the identification of performance indicators and metrics that can be used to assess performance against the completion criteria established for each rehabilitation area.

1.2 Post-mining land use

For New Oakleigh Mine, Schedule F – Table 1 of the Environmental Authority (EA) (EPML00350213), nominates PMLUs for various rehabilitation areas. However, the EA does not nominate the specific locations of rehabilitation areas. Under the conditions of the current EA, New Hope is required to rehabilitate 30 hectares (ha) to the native ecosystem land use, 361 ha to grazing, 2 ha to sediment and water supply dams with an allowance for a 19 ha residual void located on ML50175. However, the residual void is no longer applicable as all voids have been backfilled. Some infrastructure will also be retained that is not captured in the EA.

With respect to the native ecosystem outcome, approximately 15 ha is located in Oakleigh West and has already undergone rehabilitation works towards this outcome. A further 15 ha of native ecosystem is to be rehabilitated within nominated areas of Oakleigh East. The remainder of the disturbance area not already occupied by water management structures or retained infrastructure will be rehabilitated to a grazing PMLU.

1.3 Rehabilitation objectives and completion criteria

For each PMLU a set of milestone criteria has been developed to demonstrate that the PMLU is safe, stable, does not cause harm to the environment and can sustain the nominated PMLU. The milestone criteria provide quantitative indicators of the progress of the Project towards achieving the overall rehabilitation and closure objectives.

The rehabilitation objectives, completion criteria and relevant indicators identified for New Oakleigh Mine are reproduced in Table 1. The performance indicators are assessed against completion criteria, which act as targets for each milestone and the rehabilitation process overall. The rehabilitation areas referred to, and their relationship with rehabilitation milestones, are discussed further in section 3.5.3 of the Progressive Rehabilitation Closure Plan (PRCP).

Table 1: New Oakleigh Mine: rehabilitation objectives, completion criteria and indicators

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)
RM1 **(Rehabilitated)**	• Absence of mine infrastructure equipment and materials not required for the PMLU.	• All non-required services disconnected and removed; • all non-required concrete, bitumen and gravel removed; • all non-required operational pipelines drained and removed; • all fencing that is not part of PMLU requirements removed; • all non-required buildings demolished and/or removed; • all machinery and equipment removed; • all non-retained surface water drainage infrastructure removed; and • all rubbish removed.	In-pit spoil (RA3), Tailings dam (RA4), North highwall (RA5), Eastern drainage (RA6), Normanton mine disturbance (RA7), Native ecosystem rehabilitation area (RA8), and North mine disturbance (RA9)
	• Absence of contaminating materials/ contaminants.	• Where required or applicable, contamination is remediated or removed.	
	• Evidence of appropriate landform surface preparation (contour ripping, presence of topdressing, application of amelioration materials where required). Only applicable to rehabilitation post 2021.	• All bulk earthworks and landform works completed; • Sufficient topdressing material (topsoil or a suitable topsoil substitute) spread over reshaped surfaces; • ameliorants have been applied where required to improve soil quality characteristics; and • visible evidence of ripping/discing along the contour (not applicable to historical rehabilitation areas).	
	• Revegetation (seeding, planting or acceptable natural recruitment). • Seed germination and development of groundcover establishment.	**Grazing and Native Ecosystem PMLU:** • Records of seeding/planting at design rates/densities; • rehabilitation monitoring data demonstrating successful revegetation; and • Evidence of target germination rates, planting success and recruitment from initial monitoring.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)
RM2 (Stable)	• Stable landform development through: o acceptable final landform slopes (i.e. as designed); o geotechnical study completed by a suitably qualified person assessing the factor of safety for all final landforms; and • drainage design by suitably qualified person.	• 90% of the final landform achieves slope gradients of 30% or less; and 80% of the final landform achieves slope gradients of 20% or less; • landform construction of north highwall area (RA5) meets design criteria of slopes <40% with the exception of slopes in area A, which may exceed 40%: and • RA5 north highwall area vegetated and assessed by a suitably qualified person as stable with a minimum FOS of 1.5; • constructed landform in the eastern drainage works area (RA6) meets design criteria of maximum slope gradient of 20%; and • RA4 Tailings Dams assessed by a suitably qualified person as stable.	
	• Vegetation cover based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Erosion classification determined based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Land suitability assessment by an appropriately qualified and experienced person. • Acceptable surface water quality based on water quality monitoring program.	**Grazing PMLU:** • Vegetation groundcover exceeds the 70th percentile of reference sites; • erosion classification (per the Monitoring and Maintenance Plan (MM Plan)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance. • Retained storage water quality parameters (as defined in the MM Plan) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000) with the exception of TDS measured at Urry Road dam (OW21). At this water storage the livestock 'high risk' trigger values for TDS will apply, unless sufficient data is available and demonstrates that Urry Road water quality has no detrimental impact on the TDS values of the Bremer River as measured at Station 143107A.	Retained infrastructure (RA1), Water management structures (RA2), In-pit spoil (RA3), Tailings dam (RA4), North highwall (RA5), Eastern drainage (RA6), Normanton mine disturbance (RA7), Native ecosystem rehabilitation area (RA8), and North mine disturbance (RA9)

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)

RM2 (Stable)
cont.
		Native Ecosystem PMLU:
		• Monitoring shows key species are present including:
		  ○ Crows ash (*Flindersia australis*);
		  ○ Brigalow (*Acacia harpophylla*); and
		  ○ Whitewood (*Atalaya salicifolia*)
		• ≥ 35% of Foliage Projective Cover (FPC) (T1 canopy cover) at analogue site(s);
		• landform is deemed safe for fauna;
		• landform construction achieves suitable slope gradients of 30% or less;
		• erosion classification (per the MM Plan) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and
		• no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)
RM2 (Stable) **cont.**		**Water Storage PMLU:** • Surface water overflows from retained storage, Urry Road dam (OW21) meet the following criteria: o pH: 6.5-9.0; and o TDS: 10,000 mg/L; or o surface water quality data demonstrates Urry Road dam water quality has no detrimental impact on the pH and TDS values of the Bremer River as measured at Station 143107A. • Surface water overflows from all other retained storages meet the following criteria: o pH: 6.5-9.0; and o TDS: 4,000 mg/L. • Retained storage water quality for other parameters (per the MM Plan (Appendix F)) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000).	
		Retained infrastructure PMLU: • No recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance; and • landform construction achieves slope gradients of ≤20% with the exception of slopes constructed in excess of 33% to achieve synergy with surrounding topography.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)
RM3 (Achievement of target PMLU)	• Vegetation cover and diversity based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Land suitability assessment by an appropriately qualified and experienced person. • Erosion classification determined based on data acquired through the Rehabilitation Monitoring and Maintenance Plan. • Acceptable surface water quality based on water quality monitoring program. • Hazard and Safety Assessment by suitably qualified person. • Contaminated land assessment to demonstrate no residual contamination.	**Grazing PMLU:** • provide a final rehabilitation report including monitoring records; • assessment of carrying capacity by suitably qualified person demonstrates a sustainable grazing outcome has been achieved; • > 75% of groundcover vegetation comprises recognised pasture species; • relevant land capability class III / VIII achieved; • erosion classification (per the MM Plan (Appendix F)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance.	Retained infrastructure (RA1), Water management structures (RA2), In-pit spoil (RA3), Tailings dam (RA4), North highwall (RA5), Eastern drainage (RA6), Normanton mine disturbance (RA7), Native ecosystem rehabilitation area (RA8), and North mine disturbance (RA9)

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)
RM3 (Achievement of target PMLU) **Cont.**		**Native Ecosystem PMLU**: • Key species present including: o Crows ash (*Flindersia australis);* o Brigalow (*Acacia harpophylla*); and o Whitewood (*Atalaya salicifolia*) • ≥ 50% of number of native flora species/ha as present at analogue sites; • ≥ 70% of the T1 canopy height at analogue site(s); • ≥ 50% of FPC (T1 canopy cover) at analogue site(s); • landform is deemed safe for fauna; • evidence of low risk of land contamination via a contaminated land assessment report; • erosion classification (per the MM Plan (Appendix F)) to be comparable with erosion classifications from nearby equivalent land uses with similar landform parameters to be determined by establishing analogue sites at suitable comparable sites; and • no recorded erosion classifications of 'Severe' or 'Extreme', or areas requiring continuous maintenance.	

Milestone reference	Performance indicators	Completion criteria	Applicable Rehabilitation Area (Table 5)
RM3 (Achievement of target PMLU) **Cont.**		**Water Storage PMLU:** • No regulated structures to be retained; • all retained water storages (banks and spillways) to be assessed for safety and function by an appropriately qualified person; • Surface water overflows from retained storage, Urry Road dam (OW21) meet the following criteria: o pH: 6.5-9.0; and o TDS: 10,000 mg/L; **or** o surface water quality data demonstrates Urry Road dam water quality has no detrimental impact on the pH and TDS values of the Bremer River as measured at Station 143107A. • Surface water overflows from all other retained storages meet the following criteria: o pH: 6.5-9.0; and o TDS: 4000 mg/L. • Retained storage water quality for other parameters (per the MM Plan (Appendix F)) to be below the 'low risk' trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000).	
		Retained infrastructure PMLU: • Final landform survey confirms no built structures remain other than those that form part of a landholder agreement; • no recorded erosion classifications of 'Severe' or 'Extreme'; and • landform construction typically achieves slope gradients of ≤20%, with the exception of slopes constructed in excess of 33% to achieve synergy with surrounding natural topography.	
		All PMLUs: • Hazard and Safety Assessment demonstrates hazards in rehabilitation areas are of a similar type and not significantly different to hazards in neighbouring similar PMLUs (i.e. low risk);	

2 Monitoring program type

2.1 Rehabilitation inspections

Rehabilitation inspections provide the opportunity to acquire semi-quantitative data relating to rehabilitation performance with nominal preparation and effort. New Oakleigh Mine's approach to monitoring will incorporate:

1) Event-based inspections: i.e., following significant weather events (and when safe to access), rehabilitation areas are to be visited and the following data collected:
    a) photographs of any new instances of erosion, graded bank failure, capacity and condition of water storages, loss of vegetation or other biota;
    b) where possible, estimate the extent of any new instances of erosion including, for example, rehabilitation area, rill lengths, widths and depths, slope and location on slope;
    c) observations of vegetation health, cover, instances of lack of vegetation
    d) stability and function of erosion and sediment control and water management structures;
    e) presence of weeds and/or pests; and
    f) any other relevant observations.
2) Routine monitoring: at least annually, and when safe to access, rehabilitation areas are to be visited and the following data collected:
    a) photographs of any new instances of erosion, graded bank failure, capacity and condition of water storages, loss of vegetation or other biota;
    b) where possible, estimate the extent of any new instances of erosion including, for example, rehabilitation area, rill lengths, widths and depths, slope and location on slope;
    c) observations of vegetation health, cover, instances of lack of vegetation
    d) stability and function of erosion and sediment control and water management structures; and
    e) presence of weeds and/or pests; and
    f) any other relevant observations.

A standardised data collection approach is to be utilised to allow temporal analysis to be undertaken.

2.2 Rehabilitation monitoring and frequency

Rehabilitation monitoring provides the opportunity to acquire scientific, quantitative data relating to rehabilitation performance; however this approach requires planning effort and monitoring resources. New Oakleigh Mine's approach to monitoring includes:

1) Initial establishment monitoring: that is for newer rehabilitation areas and annually for the first three years from initial establishment. This will include the Eastern Drain revegetation incorporating the Grassroots™ product. A rapid assessment is to be undertaken at a consistent time of year (post-wet season), and the following data collected:
    a) percentage estimate of bare ground;
    b) estimate of general vegetation height;

c) vegetation composition (comparison with sown species);

d) observations of plant species of management concern (pest species);

e) observations of erosion including depth, width, suspected cause (e.g., soil dispersibility, run-on drainage, graded bank failure etc.); and

f) photo point monitoring.

3) Long-term monitoring: initially biennially for grazing and native ecosystem PMLUs, and annually for water quality monitoring; with monitoring frequencies to be reviewed at five years from initial establishment based on monitoring results, i.e., as completion criteria are approached, monitoring frequencies can be lowered. The detailed rehabilitation long-term monitoring methodology used is described in section 3.

Consideration will be given to integrating rehabilitation monitoring programs with remote sensing technologies where these can be demonstrated to provide comparable, replicable, broad area information that meets the objectives outlined for rehabilitation monitoring in section 1.

2.3 Rehabilitation monitoring records

For all future rehabilitation campaigns (i.e., following seeding or planting of a rehabilitation area), the complete details of the rehabilitation operation are to be recorded, and are to include:

- topsoil source, analysis results and pre-treatments applied;
- surface preparation works (e.g., contour ripping including depth, spacing, machinery, graded bank design parameters, addition of ameliorants including type and rate);
- climatic records;
- revegetation species, rates and sowing method;
- fertiliser applications including types, rates and timing; and
- maintenance works undertaken.

Where possible, records will be maintained, including rehabilitation area polygons, using a geographic information system.

2.4 Rehabilitation monitoring plan review

A review of the effectiveness of the rehabilitation monitoring plan is to be undertaken at least every two years. The following aspects will be considered as a minimum:

- post-mining land use, completion criteria, and indicator validity and effectiveness;
- appropriateness of inspection and monitoring frequency;
- overall rehabilitation performance; and
- requirements for maintenance works including frequency and severity of works required.

3 Monitoring methodology

The following subsections detail the monitoring methodology implemented. A combination of field surveys and aerial and satellite imagery will be utilised for the monitoring of rehabilitation activities. Monitoring will involve the collection of quantitative data relevant to assessing the progression towards, and the achievement of the completion criteria detailed in Table 1 for the purpose of determining the achievement of each rehabilitation milestone.

3.1 Vegetation and soil erosion surveys

3.1.1 Grazing

Surveys are to be conducted within mine rehabilitation areas and the analogue site L566 CH31740 in accordance with the methodology outlined in the Minesite Rehabilitation Report (EA Systems 2008). The following data will be collected:

- foliage projective cover;
- species diversity;
- standing dry matter; and
- erosion rates.

Permanent monitoring transects should be established in rehabilitation and unmined (analogue or reference) areas, where available. Monitoring plots should be randomly located within each rehabilitation area according to age class of the rehabilitation. The recommended minimum number of transects for rehabilitation areas per age class and type of pasture is shown in Table 2.

Table 2: Recommended minimum number of pasture transects

Area (ha)	Minimum number of transects
0-10	1
> 10-25	3
> 25-50	4
> 50-100	5

Pasture reference transects should be at sufficient replication to allow for statistical testing that is rigorous enough to determine differences between reference site and rehabilitation values and the achievement of completion criteria. A minimum of three transects within each representative reference pasture area is recommended.

A plot-based approach will be utilised for monitoring grazing pasture. Individual sampling sites should be randomly selected using Bullseye™ GPS or similar. Within each sampling site, ten (10) quadrat sampling points shall be randomly selected as per the technique described by EA Systems (2008).

3.1.1.1 Foliage projective cover and species diversity

Foliage projective cover will be determined using point frame quadrats. Once the sampling point has been identified, the point frame quadrat should be placed at 90^{o} to the tip of the foremost of the sampler's feet. Record projective cover in each quadrat on the basis of the uppermost contact each of the quadrat points make when lowered following placement of the frame. Record the cover of:

- live plant material (i.e. 'green foliage');
- dead foliage and surface litter; and
- bare ground.

Where contact is made with live plant material, identify and record the taxa to species level, or where appropriate to the family or genus level.

3.1.1.2 Standing dry matter

Visually assess the standing dry matter at each sampling point using the photo-standards in Hacker *et al.* (2005). Score the standing dry matter using the ordinal scale shown in Table 3.

Table 3: Scores applied in assessing standing dry matter against photo-standards

Score	Standing dry matter (kg/ha)
1	50 – 100
2	100 – 300
3	300 – 600
4	600 – 900
5	900 – 1200
6	1200 – 1500
7	1500 – 2000
8	>2000

3.1.2 Native ecosystem

A transect based approach will be utilised for vegetation monitoring. This approach aims to provide a measure of the capacity of a terrestrial ecosystem to maintain biodiversity values at a local or property scale and allows a comparative assessment of pre- and post-mining ecosystems.

The survey methodologies outlined below have been adapted from the Queensland Herbarium survey technique 'Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland' (Neldner *et al.* 2019) and the 'Method for the Establishment and Survey of Reference Sites for BioCondition' (Eyre *et al.* 2017).

BioCondition monitoring assesses a suite of parameters at different landscape positions on each site, namely on flats, slopes and in troughs (Eyre *et al*. 2017). Repeated edaphic (soil properties) and biological measurements are taken over time for various parameters that indicate changes in ecosystem function as rehabilitation proceeds.

Vegetation monitoring will involve the collection of quantitative data relevant to the land use and vegetation being monitored. This may include:

- ground cover percentage;
- canopy cover;

- species richness;
- woody stem density;
- recruitment; and
- weeds.

Permanent monitoring transects should be established in rehabilitation and unmined (analogue or reference) areas, where available. Rehabilitation and reference site monitoring transects shall be stratified according to the target native ecosystem type.

Native ecosystem reference and rehabilitation sites shall be paired according to the pre-clearing RE or vegetation community being targeted for re-established to enable robust comparative analyses. Pre-clearing REs/communities applicable to each disturbance area are shown on the *Queensland Vegetation Management Act (1999)* map of pre-clearing REs. In the case of the proposed native ecosystem rehabilitation areas at New Oakleigh, the preclearing RE is 12.9-10.6/12.9-10.2 (90/10), and the target RE is RE 12.9-10.6, consistent with the remnant ecosystem remaining adjacent to New Oakleigh West. A sampling intensity of three rehabilitation transects should be established per 15 ha rehabilitation area (i.e., three (3 at New Oakleigh West and three (3) at New Oakleigh East).

It is also recommended that the frequency and timing of monitoring of reference sites coincides with monitoring of rehabilitation areas. Where possible, reference sites should be chosen that replicate anticipated rehabilitated area slopes. To ensure sampling repeatability over the life of the monitoring program, each transect is to be located in an area that is accessible. Results from reference sites will be used to compare monitoring results obtained from rehabilitated site transects.

To establish transects, at each monitoring site a 50 m tape is extended, with a star picket installed at each end of the transect to consistently and precisely identify the transect location during each monitoring event. The coordinates of each end of the transect are recorded, to establish a permanent 50 m transect. The transect area extends 5 m on either side of the 50 m tape.

Field sheets should be used to collect rehabilitation survey data.

Monitoring of vegetation will preferably be undertaken after the wet season to ensure the presence of ephemeral herbaceous plants and to assist with identification of species that require the presence of flowers/fruiting material for accurate identification.

3.1.2.1 Ground cover

Ground cover monitoring involves the collection of quantitative data on average ground cover (percent) where the percentage of all types of ground cover within ten 1 m x 1 m quadrats is determined. Similar to the transect method above, the quadrat shall be placed every 5 m on alternating sides of the transect, commencing at 0 m on the right and the final quadrat at 45 m. In each quadrat the total percentage ground foliage cover of each plant species and the percentage cover of bare soil, rock and organic litter is to be recorded.

Ground foliage cover incorporates native perennial grass cover, native annual grass cover, native forbs and other species, native shrubs (< 1m height), non-native grass, non-native forbs and shrubs, litter, rock, bare ground, and cryptogams.

3.1.2.2 Species diversity

Species diversity is assessed using the method outlined in Eyre *et al*. (2017) where all vascular plants that occur within a 10 m x 50 m plot area are recorded. The surveyor is to walk along each side of the 50 m transect centre-line and record all trees, shrubs, forbs/other species, and grasses occurring within 5 m of either side of the centre-line. Species that cannot be identified within the field are collected for later identification or sent to the Queensland Herbarium for identification.

3.1.2.3 Stem density

Woody stem density is calculated using a methodology adapted from the 'Method for the Establishment and Survey of Reference Sites for BioCondition' (Eyre *et al*. 2017). All woody stems for each tree and shrub species are counted within the 10 m x 50 m plot area (i.e., 5 m either side of each 50 m transect). From this data, both total woody stem density as well as the density of each individual tree or shrub species is calculated. The density of species and growth forms on the monitoring sites is then calculated using the following equation:

Density per hectare (ha) = number of stems recorded within the transect x 20.

3.1.2.4 Recruitment

Recruitment is assessed using a methodology adapted from Eyre *et al*. (2015), whereby recruitment is assessed over the 10 m x 50 m plot (5 m either side of each 50 m transect). Within this plot, the proportion of dominant species found to be regenerating are counted. A regenerating individual is identified as a woody stem species at breast height, with a diameter of <5 cm. For each dominant canopy species present, at least one individual must be present as a sapling or seedling for the species to be considered as regenerating. The presence of all dominant species in the regenerative state would make up 100% recruitment.

3.1.2.5 Canopy cover

Tree canopy cover can be used to characterise stand productivity and the distribution and abundance of biomass (Eyre *et al*. 2017). It refers to the estimation of the percentage canopy cover of the living, native tree layer along a 50 m transect, using the line intercept method (Greig-Smith 1964). For this attribute, the vertical projection of tree canopy cover of the species making up the tree canopy cover is assessed. The vertical projection of the tree canopy over the 50 m transect is recorded as illustrated in Figure 1. The total length of the projected canopy of each layer is then divided by the total length of the tape to give an estimate of percentage canopy cover for the site.

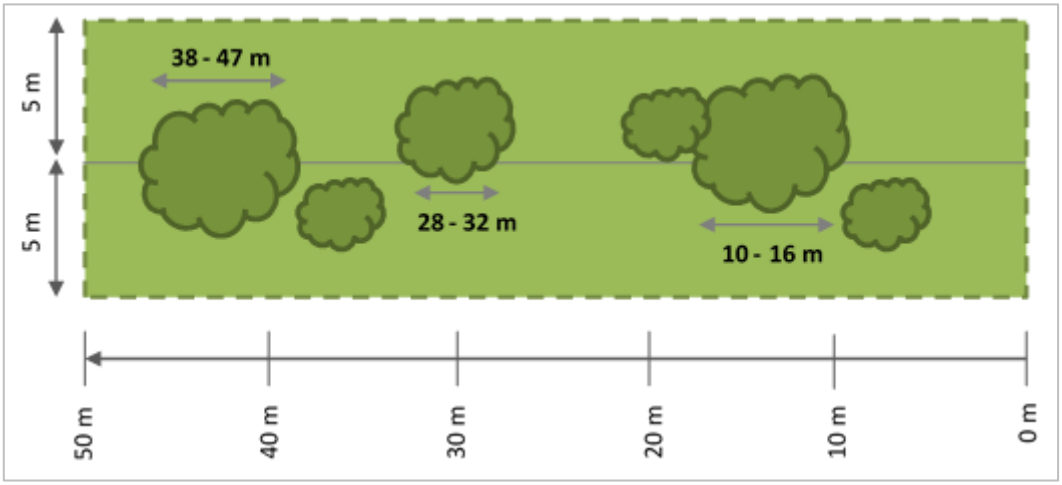

Figure 1: Guide to monitoring canopy cover (after Eyre et al. 2017)

3.1.3 Soil erosion

3.1.3.1 Erosion monitoring

An erosion monitoring methodology has been developed by with consideration to relevant guidelines, research, and experience (Neldner *et al*. 2020, Eyre *et al*. 2017 and Eyre *et al*. 2015). Erosion monitoring is to be conducted across all analogue and rehabilitation monitoring locations. Rehabilitation areas will be inspected to assess the extent of erosion features and an erosion rating for each site will be determined.

Erosion features or indicators may include wind or sheet erosion, erosion rills, gullies or tunnels, or signs of slumping.

Erosion at survey sites is monitored through visual assessment over time. Assessment is undertaken by traversing the 50 m transects and recording the number and average depth of any erosion features or rill lines. Table 4 is used to record and classify these observations. The overall classification of erosion at each transect site is determined by the higher classification attributed to either the number of rills/gullies or the average depth. For example, a transect may present only one or two rills but if these are recorded as being 25 cm deep, the transect will be classified as presenting a 'Moderate' erosion classification. Obvious cases of localised settlement which are not causing any subsequent erosion are not considered instances of erosion.

Table 4: Erosion classification

Erosion classification	Minor	Moderate	Severe	Extreme
No. of rills/gully	< 15	15–30	31–50	> 50
Average depth (cm)	< 10	10–30	30–60	> 60
Proportion of site affected by disturbance (%)[1]	< 1	1–5	> 5	—

Source: after Neldner *et al*. 2020

It should be noted that the placement of permanent transects may not be representative of the level of erosion across the entire rehabilitation area landforms. To compensate for this, general observations undertaken during the survey are also utilised in assessing rehabilitation performance. The location of any severe erosion outside the transect (i.e., tunnels, mass wasting, large gullies) is recorded and marked with a handheld GPS instrument.

The following information is recorded at each site:

- GPS reading of location;
- general description of type of erosion (gully [>30 cm], rill line [<30 cm], circular failure, tunnelling etc.) and possible causes;
- depth of erosion;
- width of erosion;
- length of erosion;
- where eroded material is being deposited; and
- whether the erosion line is being stabilised by vegetation.

3.1.4 Soil monitoring

Soil monitoring involves the collection of topsoil samples from a maximum depth of 10 cm to obtain quantitative data on the chemical and physical properties of soil. Soil sampling methodology has been adapted from 'Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009' (DES 2018). Soil sampling is conducted by collecting approximately 200 g samples with a clean non-metallic shovel and bucket every 10 m along the 50 m transect. The first sample is collected at 0 m. These five samples are mixed in the bucket. The final 200 g soil sample is taken from the mix and placed into plastic sample bag. Samples are sent to a National Association of Testing Authorities (NATA) certified laboratory for analysis of indicators of soil nutrition and land contamination.

Soil moisture content shall be measured for interpretive purposes only and will not be assessed in determining rehabilitation performance.

Ideally, rehabilitation site data should reflect that of analogue sites, though data indicating a trajectory to meet performance criteria may be sufficient in supporting the chosen post-mining land use.

3.1.5 Photographic monitoring

Photographic monitoring provides a visual record of the vegetation, ground cover, erosion, and general appearance of each analogue and rehabilitation site, allowing these sites to be compared over time (Eyre *et al*. 2015). A digital camera is used to take photos so that a permanent record can be kept for each site. The process of taking the monitoring photos is as follows:

1) The site, date the photo was taken and the direction the photo was taken should be recorded for each photograph taken. A data board included in the photograph can be useful for this purpose.

2) The person taking the photograph stands at the star picket which marks the beginning of the 50 m.

3) The camera is aimed directly towards the end of the 50 m transect and a single, landscape photograph is taken.

4) The person then stands at the star picket which marks the end of the 50 m transect.

5) The camera is aimed directly towards the start of the 50 m transect and a single photograph is taken.

6) Steps 1 – 6 are repeated for all terrestrial monitoring sites.

The digital photographs are to be downloaded and stored for future reference.

3.1.6 Emerging monitoring technologies

Where emerging technologies can be implemented as a cost-effective means of assessing rehabilitation success, these will be reviewed and introduced as appropriate. An example of such technology is the determination of a normalised difference vegetation index based on aerial imagery; which can be used to assess vegetation cover and vegetative health.

3.1.7 Fauna observations

Observations of any fauna species presence within or in the vicinity of the rehabilitation areas will be noted as part of rehabilitation monitoring.

3.2 Water quality monitoring

Surface water and groundwater monitoring events will be scheduled annually (or more often as required) following a wet period. There is currently a broad suite of parameters used to assess water quality against the recommended water quality trigger values for livestock drinking water (ANZECC & ARMCANZ 2000). These parameters will be regularly reviewed and refined over time. At a minimum the following parameters should be included:

- pH;
- electrical conductivity (EC);
- total dissolved solids (TDS);
- total suspended solids;
- copper;
- iron;
- lead;
- manganese;

- sulphate;
- nitrate;
- aluminium;
- arsenic;
- boron;
- cadmium;
- chromium;
- cobalt;
- mercury;
- molybdenum;
- nickel;
- selenium;
- silver;
- uranium;
- vanadium; and
- zinc.

These parameters are either specified in the completion criteria or key parameters in the assessment of aquatic ecosystem health and livestock drinking water quality (ANZECC & ARMCANZ 2000).

Surface water monitoring will be conducted at all water storages identified as 'RA2 Water Management Structures'. To identify any detrimental impacts of water quality released from site water storages, water quality data from the Bremer River water quality sampling station 143107A will be accessed (where available) from the Queensland Government Water Information Monitoring Portal. Surface water monitoring sites and sampling frequency may be refined over time to incorporate the most appropriate sites and timing for ongoing monitoring.

3.3 Cattle grazing trials

Cattle grazing trials may also be used as a monitoring tool to determine the carrying capacity of grazing PMLU areas. Where land is considered safe and stable (i.e., upon achievement of milestone RM2), grazing trials may be carried out to demonstrate the achievement of a sustainable grazing outcome and the target PMLU (milestone RM3). Grazing trials should be targeted to determine that the rehabilitated areas are able to sustain cattle grazing of current agricultural practices and will be used in a comparative analysis with nearby analogue sites.

The following records of grazing trials will be maintained:

- date of grazing trial;
- GIS files of the areas where the trials have occurred with areas of different soil mapping units and different dominant grasses being additionally mapped;
- stocking rates;
- soil health;
- dominant pasture grass(es) and percentage of cover; and
- use of supplementary feeds, if utilised.

4 Data analysis, interpretation and reporting

4.1 Laboratory analysis

All water and soil samples collected during rehabilitation monitoring will be sent to a NATA certified laboratory for analysis of the recommended parameters.

In the event that any plants cannot be identified in the field, samples will be sent to the Queensland Herbarium for identification.

4.2 Progress reporting

Rehabilitation monitoring reports will be prepared at an appropriate frequency following the collection of monitoring data with the purpose of presenting analyses of monitoring results and evaluating rehabilitation progress towards completion criteria. This ongoing evaluation will enable the early detection of unfavourable trends in measured indicators and identify any requirements for adaptive management practices to ensure rehabilitation success and certification in the long-term.

4.3 Interpretation

Rehabilitation monitoring results will be analysed both categorically and temporally. Results obtained from rehabilitation sites will be compared to analogue sites from the same final land use vegetation community. Rehabilitation monitoring results will also be compared with historical data where possible to detect any trends over time. Common variables such as climatic conditions, seasonal variation and other event specific circumstances will also be considered in the analysis of rehabilitation data.

4.4 Statistical analysis

The analysis of rehabilitation monitoring results will involve comparing rehabilitation sites generally across the Project using the following analytical methods where appropriate:

- Statistical analysis will be undertaken where required to identify any significant differences between sample means. To determine any significant differences ($\alpha = 0.05$) between the means of rehabilitation characteristics recorded across analogue and rehabilitation sites, it is recommended that rehabilitation performance be assessed using a t-test (where a minimum of three sites are available providing sufficient statistical replication) or a similar nonparametric test where the data is not normally distributed. Variables measured at analogue and rehabilitation sites are considered statistically comparable where no significant difference between the means is detected.
- In relation to vegetation and soil quality characteristics, the mean values +/- 1 standard deviation will be calculated for comparison of analogue and rehabilitation site data; and
- Temporal variation will be presented graphically for vegetation and soil quality variables as required to identify any outliers or ongoing trends.

5 Maintenance

5.1 General maintenance

Following rehabilitation activities, access to rehabilitated areas should be limited to monitoring, and maintenance and management activities until RM3 is achieved.

Where initial plantings in native ecosystem areas show poor survival rates, supplementary planting may be required throughout the maintenance period.

Follow-up maintenance (e.g., weed and grass suppression) is deemed critical to the success of the native ecosystem rehabilitation areas. The presence of invasive exotic pasture species throughout surrounding grazing areas ensures that weed suppression will be a long-term maintenance issue (Matthews 2005).

In accordance with the existing maintenance recommendations (Matthews 2005), maintenance activities will involve the following weed suppression techniques, as required:

- A weed eradication program will be developed and implemented on site to target potential sources of weed contamination (e.g., Tipuana, Glycine, Boxthorn, etc.).
- Periodic slashing and/or mulching should be undertaken and accompanied with herbicide application (as required) for a duration deemed appropriate to achieve the final milestone criteria.
- In the event that mass supplementary planting is required:
    - slashing will be conducted immediately prior to cultivation (ripping); and
    - herbicide, e.g., Glyphosate 360™, will be applied along rip lines to a minimum width of 1.5 metres immediately after cultivation (ripping).

Fencing will be used to segregate native ecosystem and grazing rehabilitation areas to prevent access by grazing cattle until completion criteria are achieved, and then managed to maintain the area until mining lease surrender.

Grazing trials may be conducted on land rehabilitated to grazing outcome to test the ability of rehabilitated grazing pastures to meet sustainability and productivity conditions as prescribed in the EA.

5.2 Remediation activities

Significant rainfall events, localised flooding, fire, drought, pest species outbreaks or other factors may also result in a requirement to maintain rehabilitated areas. Visual inspection of revegetated areas should be undertaken regularly to determine maintenance requirements. Maintenance of rehabilitated areas or reparation may also be required where visual observations of rehabilitation and or rehabilitation monitoring results indicate that the expected trajectory towards achieving completion criteria is not being met. Depending on the underlying cause of failed rehabilitation, reparation maintenance activities may include:

- seeding, mulching and/or application of Grassroots™ or other matting;
- the application of gypsum, fertiliser, biosolids or feedlot manure at rates dependent on the results of soil testing;
- earthworks to repair eroded areas;
- re-seeding / replanting failed or unsatisfactory areas;
- supplementary planting of tube stock;
- irrigation in drier areas; and
- repair or alteration of drainage structures.

In the event that significant maintenance or remedial work is required, a maintenance plan will be developed that properly assesses the risks of re-entering a rehabilitated area with earthmoving equipment, the sourcing of soils and topsoil, impacts on planned drainage of the site, erosion controls and revegetation methods.

Appropriate reparation techniques may be developed through research trials to maximise site-specific rehabilitation success.

In addition, there are planned remediation works for the North Highwall and Eastern Drainage remediation areas at Oakleigh East (refer to section 3.5.4.2 of the PRCP for a description of planned works).

The area nominated as native ecosystem at Oakleigh East has previously been revegetated with native tree and shrub species. Over time these areas have become invaded by introduced weed species such as Tipuana (*Tipuana tipu)*, Glycine (*Neonotonia wightii*) and Climbing Asparagus Fern (*Asparagus plumosus*). Within this area, 15 ha will undergo rehabilitation efforts including the removal of weed infestations and infill planting of native trees and shrubs to achieve the target native ecosystem PMLU.

5.3 Weed and pest management

The first few years following planting are critical for controlling the spread of invasive species. As pioneer species, weeds tend to out-compete native species on disturbed soils before desirable species have had time to set roots and adequately cover a rehabilitated area. During the first three growing seasons, botanical surveys and hand removal of weeds or targeted herbicide applications should be pursued. Weed cover should be comparable to analogue site.

Three category 3 restricted invasive plants, as classified under the *Biosecurity Act 2014,* are known to impact on the native ecosystem rehabilitation areas including Climbing Asparagus Fern (*Asparagus plumosus*), Velvety Tree Pear *(Opuntia tomentosa)* and Lantana (*Lantana camara*). Other environmental weeds known to occur in the rehabilitation areas include:

- Tipuana (*Tipuana tipu*);
- Glycine (*Neonotonia wightii*);
- Green Panic (*Panicum maximum* var. *trichoglume*);
- Brazillian Nightshade (*Solanum seaforthianum*);
- Balloon Cotton Bush (*Gomphocarpus physocarpus*); and
- Cobbler's Pegs (*Bidens pilosa*).

While Glycine is used as grazing forage it occurs as an invasive weed in native ecosystem rehabilitation areas and is to be controlled in these areas to ensure rehabilitation success.

The native ecosystem areas nominated at Oakleigh East are subject to extensive weed invasion by Glycine which has resulted in the smothering of understorey vegetation and lower tree trunks causing canopy dieback. It is recommended that, these rehabilitation areas be fenced (where not already) and managed with grazing cattle as recommended in the Department of Agriculture and Fisheries 'Invasive Plant: Glycine (*Neonotonia wightii*) factsheet'. This practice offers an opportunity to minimise herbicide use and mechanical removal until the infestations reach manageable levels. Stands of Tipuana also occur throughout the rehabilitation area and should be appropriately managed through herbicide control. A specific Weed Management Plan should be developed to guide weed management in the Oakleigh East native ecosystem rehabilitation area.

Invasive pest animals previously recorded at New Oakleigh include the Black rat (*Rattus rattus*), House mouse (*Mus musculus*), European fox (*Vulpes vulpes*), Cat (*Felis catus*) and European brown hare (*Lepus europaeus*). While all of these animals are considered invasive animals under the Queensland *Biosecurity Act 2014*, the European fox and Cat are also listed as restricted matters. Management of European foxes inhabiting the

Project site should be undertaken in accordance with relevant guidelines including the 'Restricted invasive animal – European fox (*Vulpes vulpes)* factsheet' (DAF 2020). Given the proximity of the Project site to residential dwellings it may be difficult to control a local population of feral cats.

5.4 Erosion and sediment control

Erosion and sediment control measures are to be implemented in accordance with the provisions outlined in the 'New Oakleigh Normanton Pit and East and North Drains–Summary Design Report' (KBR 2020) and the 'New Oakleigh Coal Mine: North Highwall Erosion and Rehabilitation Assessment' (Houghton 2020).

Rehabilitation at Oakleigh West and Normanton has generally been conducted in accordance with the recommendations presented by Bornhorst & Ward (2013) and Topo (2019).

Erosion and sediment controls outlined in the above documents have been recommended with guidance from 'Best Practice Erosion and Sediment Control' (IECA, 2008) as a minimum.

Erosion and sediment control structures are to be retained until disturbed areas have been stabilised and the risk of erosion or sedimentation impacts meet completion criteria and run-off water quality meets the water quality objectives detailed in accordance with the Project's EA.

6 Milestone criteria and monitoring

Three rehabilitation milestones have been developed for the Project and will be used to inform assessment against the completion criteria for the Project.

Rehabilitation milestones are site-specific, dependent on the rehabilitation function and the PMLU. The disturbance footprint has been divided into the rehabilitation areas outlined in Table 5. Refer to the PRCP for the locations of rehabilitation areas and the milestone schedule.

Table 5: New Oakleigh Mine rehabilitation areas

Rehabilitation Area Reference	Description	Post-mining-land-use
RA1	Retained infrastructure	Retained infrastructure
RA2	Water management structures	Sediment and water supply dams
RA3	In-pit spoil	Grazing
RA4	Tailings dams	Grazing
RA5	North highwall	Grazing
RA6	Eastern drainage	Grazing
RA7	Mine disturbance (Normanton)	Grazing
RA8	Native ecosystem rehabilitation area	Native ecosystem
RA9	Mine disturbance (North)	Grazing

6.1 Rehabilitation Milestone 1: Rehabilitated

RM1 is considered to be completed when the land is rehabilitation and subject to monitoring and maintenance only. Rehabilitation activities include:

- removal of mine infrastructure, equipment or materials not required for the PMLU;
- remediation of contaminated materials or contaminants;
- appropriate landform surface preparations (e.g., bulk earthworks, profiling and contour ripping, application of topsoil or other material such as biosolids); and
- revegetation (i.e., seeding, planting or natural recruitment).

Further works may be necessary to meet contemporary rehabilitation standards and the conditions stipulated in the EA, including remedial works for RA5 and RA6, and additional planting of native ecosystem PMLU areas.

Ongoing management of rehabilitated areas may include:

- weed and grass suppression, supplementary watering when and where required, and management of cattle grazing;

- infill planting in native ecosystem areas;
- conducting grazing trials on land rehabilitated to pasture grazing PMLU; and
- remedial works on the Eastern Drain and North Highwall.
    - Maintenance activities to be conducted following remedial work on the Eastern Drain will include re-seeding and/or additional fertiliser application and/or watering in poorly performing areas (e.g., <50% cover after 12 months) as required based on monitoring.
    - Maintenance activities in the North Highwall area following remedial works may include additional surface preparations (e.g., topsoil, Grassroots™, hay bales or silt fences) and/or supplementary seeding or planting, as required.

Biennial (or more often as required) surveys of rehabilitated areas will be conducted to monitor progress of rehabilitation against the completion criteria and to determine when land can be transitioned to RM2.

Monitoring of the Eastern Drain revegetation incorporating the Grassroots™ product will be conducted annually for the first three years. Thereafter, monitoring will follow the same biennial schedule as other rehabilitated areas.

6.2 Rehabilitation Milestone 2: Stable

RM2 is considered to be met when the area is rehabilitated (where applicable), safe, stable and non-polluting, as per the completion criteria in Table 1.

Biennial (or more often as required) field surveys will be conducted to monitor progress of grazing and native ecosystem PMLU rehabilitation areas against the completion criteria and to determine when land can be transitioned to RM3. Water quality monitoring will be conducted annually (or more often as required).

The following assessments will be undertaken to demonstrate that the milestone completion criteria for RM2 have been achieved:

- Land suitability assessment; and
- Hazards, safety and stability assessment of all retained structures and landforms.

6.3 Rehabilitation Milestone 3: Achievement of target PMLU

The achievement of a stable landscape that can support the nominated PMLU will be assessed against the completion criteria outlined in Table 1. The following monitoring and assessment data will be used to determine that the land has achieved RM3:

- closure post-mining soil and land suitability assessment;
- vegetation and erosion assessment (as described in section 3.1) to be provided in a final rehabilitation report;
- an assessment of carrying capacity by a suitably qualified person that demonstrates a sustainable grazing outcome has been achieved;
- surface water assessment incorporating all water quality monitoring data obtained throughout the rehabilitation and closure period;
- contaminated land assessment; and
- hazards, safety and stability assessment of all retained structures and landforms.

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